

120 WATER DISTRIBUTION SYSTEMS

120.01 GENERAL

120.01.01 All public water main extensions shall be designed by a Design Professional and shall be approved by the Public Water Supply Section of NCDEQ/DEH. All designs shall comply with these Standard Specifications, the design guidelines and rules of NCDEQ/DEH, or any other State or Federal regulations that govern, whichever of them are more stringent.

120.01.02 All water main extensions and distribution facilities which connect to the water distribution system of the Town shall be considered as public facilities up to meter, valve, or backflow preventer prior to the private distribution system. Private distribution systems which are to be served by the Town water system shall be built to the applicable State Plumbing Code and NCDEQ/DEH standards, except that materials, installation and hydrant spacing shall conform to Town standards.

120.01.03 All information on fire hydrants and fire flow is contained in Section 140.

120.02 DESIGN AND INSTALLATION

120.02.01 Water transmission lines shall be located and sized in accordance with the current "Water System Master Plan" or as directed by the Town, and shall extend to the adjacent properties to provide an adequate network.

120.02.02 All public water mains shall be located within dedicated ROW or dedicated easements as described in Section 100.

120.02.03 Easements for public water mains shall be used only when an obstruction such as a culvert or other utilities prevents the public water main from being located within the dedicated ROW and must be approved by the Public Utilities Director.

120.02.04 Minor subdivisions, as defined by the Land Development Ordinance, with one or more lots with no public ROW access shall require a private water line located within a private easement to serve all the lots. The private water system shall be permitted through NCDEQ with appropriate operational and maintenance agreements, and a copy of the agreements provided to the Town. The private water main serving the minor subdivision lots shall be installed prior to plat recordation. Metering shall be in accordance with the Town Code of Ordinances as it relates to public meters connected to private water mains.

120.02.05 In residential districts, water mains shall have a standard minimum diameter of 8 inches. If a good hydraulic grid exists, 6-inch diameter pipe may be allowed, however, the maximum length of a run of 6-inch pipe within that grid shall be 600 feet. 6-inch pipe may also be allowed on residential cul-de-sacs with only one fire hydrant required, however, if that cul-de-sac serves multi-family buildings the water main shall be a minimum of 8 inches in diameter.

120.02.06 In all non-residential zoned areas, water mains shall have a standard minimum diameter of 12 inches. If a good gridiron exists, 8-inch diameter pipe may be allowed, however, the maximum length of a run of 8-inch pipe within that gridiron shall be 1200 feet.

120.02.07 The maximum length of 8-inch water main without connecting to a larger diameter main shall be 2000 feet.

120.02.08 Water mains, of proper size, shall be installed complete by the connecting property, along all boundaries abutting existing public roadways, from property line to property line. For subdivisions the water mains, of proper size, shall be installed complete, along all boundaries abutting existing public roadways regardless of the proposed lot arrangement of the subdivision property.

120.02.09 All water main distribution pipe shall be ductile iron or C-900 PVC. See the Approved Manufacturer's List in the Appendix for a list of acceptable water main pipe and appurtenance manufacturers. Pipe materials shall be as specified in Section 100.

120.02.10 Where water mains "dead end" or are terminated for future extension, at least one 18-foot joint of ductile iron pipe shall be installed with a thrust collar, main line valve, and blow-off assembly. The "dead end" water main shall terminate within a ROW or dedicated utility easement, and shall extend to the property line. Proposed connections to existing "dead ends" may require upgrading or looping of existing line to satisfy the Water System Facilities Plan.

120.02.11 New water mains in cul-de-sacs or temporary dead-end streets shall be extended or "looped" to existing mains in adjacent streets when, in the opinion of the Director of Engineering, it is practical to do so in order to enhance flow and pressure in the affected area.

120.02.12 All water mains shall have a minimum cover of 3-feet measured from the crown of the pipe to the sub-grade within subdivision roads when under pavement, and minimum cover of 4-feet measured from crown of pipe to finished grade when installed outside of pavement within a subdivision. As per Section 100.04, the cover maybe reduced to 30-inches of when crossing over a storm drain when approved by the Public Utilities Director and Engineering Director.

120.02.13 When water lines are installed along a roadway that could be widened in the future, they shall be installed at sufficient depth to maintain four feet of cover from crown of pipe to the subgrade of any future road improvements including potential vertical alignment changes. Additional depth may be required in areas where future road widenings may conflict with buried pipe. The water main shall be located horizontally so as not to conflict with future storm drainage systems.

120.02.14 Water main separation distances for other utilities shall be per Section 100.04 of the Standard Specifications.

120.02.15 Reaction blocking for all fittings or components subject to hydrostatic thrust shall be securely anchored by the use of thrust restraints as described in Section 100.

120.02.16 Prior to beginning construction, the Contractor shall contact local utility companies and verify the location of existing utilities. The Contractor shall be completely

and solely responsible for locating all existing buried utilities inside the construction zone before beginning excavation. The Contractor shall be solely responsible for scheduling and coordinating the utility location work. When an existing utility is in conflict with construction, it shall be exposed prior to beginning construction to prevent damage to the existing utility.

120.02.17 Where public water mains are installed within easements crossing private property, the Town's Public Utility Department or their designees shall have the right to enter upon the easement for purposes of inspecting, repairing or replacing the water mains and appurtenances. Paved private streets, driveways, parking lots, etc. have been installed over the public water mains, the Town of Fuquay-Varina shall not be responsible for the repair or replacement of pavement, curbing, etc. which must be removed to facilitate repairs. The Public Utility Department or their designees shall excavate as necessary to make the repair, and shall backfill the disturbed area to approximately the original grade. Replacement of privately owned pavement, curbing, walkways and any other private infrastructure shall be the responsibility of the property owner or Homeowner's Association.

120.02.18 No valve in the Town water system shall be operated without authorization from the Public Utilities Director or his designee.

120.02.19 Water mains shall be laid at least 10 feet laterally from existing or proposed sewers. Where local conditions prevent a separation of 10 feet, the water main may be laid closer, provided that the elevation of the bottom of the water main is at least 18 inches above the top of the sewer.

120.02.20 Where a water main and a sanitary sewer cross, and the vertical separation is less than eighteen (18) inches, both the water main and sewer shall be ductile iron pipe, equivalent to water main standards for a distance of 10 feet on each side at the point of crossing. The water line pipe section shall be centered at the point of crossing. A water line shall not pass under a sewer line.

120.02.21 Where possible, water mains shall cross the storm drainage system above the storm drainage piping. Relaxation of the minimum cover standards may be allowed with mitigation (ductile iron pipe, pipe encasement, etc.) based on mitigating factors with approval from the Public Utilities Director and NCDEQ.

120.03 VALVES AND APPURTENANCES

120.03.01 Valves

120.03.01.01 General

120.03.01.01.01 Valves shall be installed on all branches from feeder mains and hydrants according to the following schedule: 4 valves at crosses, 3 valves at tees, one valve on each hydrant branch, and elsewhere as directed by the Director of Engineering. 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 shall be required in the feeder main at each connection in addition to the valves on the loop section.

120.03.01.01.02 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.

120.03.01.01.03 Valves shall be properly located, operable and at the correct elevation. The maximum depth of the valve nut shall be 5 feet. When valve extension kits are used, they shall be manufactured by the same company which manufactured the valve.

120.03.01.01.04 All valves and other appurtenances that receive hydraulic thrust shall receive proper thrust restraint as described in Section 100. Valves located within 10 feet of a tee or cross shall be rodded to that tee or cross (see Detail 120.16 for more information). Rodding requirements shall be as shown in Table 100.04.

120.03.01.01.05 Valves designated by the Town to potentially have a remote actuator shall be installed in a manhole as shown in the Details.

120.03.01.02 Combination Air Valves

120.03.01.02.01 Combination air valves shall be installed at all high points of water lines when the elevation difference between the highest and lowest points of the water line is greater than 25 feet, and at other locations as directed by the Director of Engineering. The water main shall be installed at a grade which will allow the air to migrate to a high point where the air can be released through an air valve. A minimum pipe slope of 1 foot in 500 feet shall be maintained.

120.03.01.02.02 The valve shall be sized by the Design Professional and listed on the Approved Manufacturer's List. Combination air valves shall be of the single housing style that combines the operation of both an air/vacuum and air release valve. The valve shall have a minimum two (2) inch NPT inlet and 200-PSIG working pressure. The valve shall meet the requirements of AWWA C512 and be installed in accordance with the Details.

120.03.01.03 Resilient seat wedge gate valves

120.03.01.03.01 Resilient seat wedge gate valves shall be manufactured in accordance with AWWA C515 for a working pressure of 200-psi or greater. All shall be mechanical joint with ductile iron body, open left with a non-rising stem and two O-ring stem seals. All ferrous surfaces, both inside and outside, shall be protected by a fusion-bonded epoxy coating.

120.03.01.04 Butterfly Valves

120.03.01.04.01 Butterfly Valves shall be installed in water lines 16 inches or greater. All shall meet the requirements of AWWA C504 with mechanical joints, 2 inch open left operating nut. Valves installed on waterlines at depths greater than 6 feet shall be installed in a manhole as shown in the Details.

120.03.01.05 Valve boxes

120.03.01.05.01 Valve Boxes shall be cast iron, screw or telescopic type, with a 5 inch opening and "WATER" stamped on the cover. All valve box assemblies and covers shall be cast from Class 35 domestic gray iron and manufactured in the USA.

120.03.01.05.02 Valve boxes located in Type 7 streets or greater shall have extended base valve box covers.

120.03.01.05.03 Valve box ring adjustments shall not be allowed. The valve box shall be centered over the wrench nut and seated on compacted backfill without touching the valve assembly. All valve boxes shall be encased in a trowel finished 2 foot x 2 foot x 6 inch pad of 3000-psi concrete beneath the asphalt with the cover flush with the top of the pavement or flush with the finished grade. Precast concrete valve box encasements may be used for valve box encasement outside of paved areas provided the assembly is buried flush with the surface grade and compacted properly to prevent movement of the precast encasement.

120.03.01.06 Actuators

120.03.01.06.01 All valves shall be provided with standard 2-inch operating nuts that comply with AWWA C500. Unless otherwise specified, the direction of rotation to open the valves shall be to the left (counterclockwise), when viewed from the top. Each valve body or actuator shall have cast thereon the word "OPEN" and an arrow indicating the direction to open.

120.03.02 Appurtenances

120.03.02.01 Pipe Fittings

120.03.02.01.01 Pipe fittings shall be cast or ductile iron designed and manufactured as per AWWA C110. Sizes of fittings up to and including 12 inches shall be designed for an internal pressure of 250 psi, and larger size fittings shall be designed for an internal pressure of 150 psi. Compact ductile iron mechanical joint fittings designed and manufactured as per AWWA C111 are also acceptable. Joints for fittings shall be mechanical unless otherwise specified herein and lined with cement mortar with a seal coat of bituminous material, all in accordance with AWWA C104.

120.03.02.02 Blowoffs

120.03.02.02.01 Blowoffs shall be a minimum of 2 inches and installed at the end of all dead-end water lines. Where there is not sufficient pressure or fire hydrants to thoroughly flush the system, a larger blowoff shall be required.

120.03.02.02.02 Blowoff Assemblies shall be constructed as shown in the Details. The valves shall be gate type with a non-rising stem and a 2 inch operating nut, O-ring seals and screwed ends. A full size valve is required on mains that are planned to be extended.

120.03.02.02.03 When lines have a severe sag (such as when running beneath large streams, ditches or culverts) where sediment can accumulate and retard flow in the water line, or as otherwise directed by the Director of Engineering, a sag blow-off shall be required.

120.04 WATER SERVICE TAPS

120.04.01 Design

120.04.01.01 Individual water services shall be provided from the main to each water meter for single family residences in accordance with the Details. Multiple branch services are prohibited for single family residences. All connections shall be made by wet taps. Service connections shall be made perpendicular to the main and shall run straight to the meter.

120.04.01.02 All water meter boxes and vaults shall be located at the edge of the serviced lot's ROW or easement. Water meter boxes shall not be placed in streets, sidewalks, parking areas or obstructed by fencing or buildings. Exceptions to these conditions shall be at the direction of the Public Utilities Director or Director of Engineering.

120.04.01.03 Provisions for backflow prevention shall be in accordance Section 130 of these Standard Specifications and the NC Plumbing Code.

120.04.01.04 Residential service taps 1 inch or less for existing residential homes (not for remodels/redevelopment for profit), to existing water lines, shall be made by the Town. Service taps greater than 1 inch, or servicing for profit residential remodels or redevelopment, or non-residential development, to existing water lines, shall be made by a Contractor of the Owner/Developer. Service taps to new water lines shall be made by the Contractor in accordance with the Specifications.

120.04.01.05 All service taps shall be done with a tapping saddle or tapping sleeve.

120.04.02 Sizing

120.04.02.01 Water meters shall be sized based on water demand, as shown in Table 120.01, or as otherwise specified by the Public Utilities Director or Director of Engineering. All non-residential projects shall submit calculations prepared by a Design Professional in conformance with the AWWA Manual of Practice for Town approval of the type and size of the meter.

120.04.02.02 Residential service lines may be required to be larger than $\frac{3}{4}$ inches in cases of long service lines or high building elevations to reduce headloss and maintain adequate pressure and flow to the residence. The need for a larger service line shall be on a case by case basis, as determined by the Public Utilities Director or Director of Engineering.

120.04.03 Materials: shall be as specified in Section 100.

120.04.04 Corporation Stops

120.04.04.01 Corporation Stops shall be ball type, made of brass and complete with a compression or flared coupling and AWWA Standard threads as per AWWA C800. Taps shall be located at 10:00 or 2:00 o'clock on the circumference of the pipe. Service taps shall be staggered alternating from one side of the water main to the other and at least 12 inches apart. The taps shall be a minimum of 24 inches apart if they are on the same side of the pipe. Taps shall be a minimum of 24 inches from the pipe bells.

120.04.04.02 No burned taps shall be allowed and each corporation stop shall be wrapped with Teflon tape for ductile iron pipe water mains. No taps are allowed on a fire hydrant line. No tapping shall be made where rodding is placed.

120.04.04.03 Taps on internal site fire lines may be allowed if calculations demonstrate adequate water demand to maintain water quality.

120.04.05 Service saddles

120.04.05.01 Service Saddles shall be used on all water mains. Service Saddles shall be bronze body (85-5-5 waterworks brass) and double strap with silicon bronze nuts conforming to ASTM A98 and factory installed grade 60 rubber gaskets.

120.04.06 Copper Service Tubing

120.04.06.01 Copper service tubing shall be type K soft copper tubing per ASTM B88. No union shall be used in the installation of the service connection of 100-feet or less. Service lines more than 100 feet shall use a three piece compression coupling. Only one compression coupling shall be used for each 100 feet or fraction thereof.

120.04.07 Copper meter setters for $\frac{3}{4}$ and 1-inch Water Services

120.04.07.01 All $\frac{3}{4}$ and 1-inch water services shall be installed with copper meter setters as shown in the Details. All copper meter setters shall be from the Approved Manufacturer's List at the dimensions shown in the Details. All residential copper meter setters shall be installed with a lockable angle ball valve and top entry cartridge vertically aligned dual check valve assembly. Copper meter setters specified for applications requiring a separate, above-ground backflow preventer may be installed without the dual check valve assembly. Copper meter setters shall be installed with compression fittings and all copper meter setter assemblies shall be provided as shown in the Details with galvanized brace pipes for additional stability. All installations shall provide the copper meter setter properly aligned with the meter box reader lid such that the meter is clearly visible below the reader lid.

120.04.08 Meter Boxes

120.04.08.01 Meter Boxes shall be as listed in the Approved Manufacturers List.

120.04.08.02 Meter Boxes for $\frac{3}{4}$ -inch and 1-inch services shall be cast iron. Meter boxes shall provide a cover opening of 11 inches X 18 inches and boxes shall measure at least 12 inches in depth. Meter boxes and covers shall be rated for "heavy duty"

uses, such as alleys, driveways, parking lots, etc. Standard meter box covers shall not bolt down to the box, and shall have the words "Water Meter" cast into the lid. The Town reserves the right to require all meter box covers to include brackets and housing for transponders for automated meter reading systems. All meter boxes and covers shall be installed as shown in the Details.

120.04.08.03 Meter boxes for 1 ½-inch services shall be cast iron. Piping for 1 ½-inch water meters shall be constructed from brass and copper tubing and shall be equipped with angled check valve outlets and by-pass flanged valve or by-pass flanged ball valve inlets. To ensure positive discharge, the box shall be tied into the existing storm drain system, or shall have an open bottom to allow drainage through a stone base.

120.04.08.04 All services 2 inches or larger shall have bypasses, strainers upstream of the meter, and be placed in a vault.

120.04.09 Meter Vaults

120.04.09.01 Meter vaults and access doors within street right of way shall meet HS-20 loading requirements and shall be located outside of travel areas. The access double doors shall be aluminum with a flush drop lift handle, stainless steel hinges and bolts, a stainless steel slam lock, an automatic hold open arm, and compression springs to allow for easy opening. To ensure positive drainage, the vault shall be tied into the existing storm drainage system. Positive drainage shall be construed to mean a "daylight" drain not less than 4" schedule 40 PVC pipe with flap valve on the end. Vault dimensions must be sized to ensure pipe work will fit within the vault. When installing pipe work, ensure it is spaced evenly within the vault.

120.05 IRRIGATION SYSTEMS

120.05.01 All irrigation systems shall be provided with privately maintained reduced pressure principle backflow prevention installed in accordance with the NC Plumbing Code and the Foundation for Cross Connection Control and Hydraulic Research. Reduced pressure principal backflow preventers shall have an appropriately sized drainage system or be installed above ground in an insulated box. The back-flow prevention device shall be inspected and tested on an annual basis. See Section 130 for additional details on backflow prevention devices.

120.05.02 All irrigation systems within public street right of way require an encroachment agreement from the Town or NCDOT prior to installation. Plans designating the location, size, material, and depth shall be submitted with the agreement application to the Inspections Department.

120.05.03 Pipe material for all lines within the public right of way shall be Schedule 40 PVC or greater. A minimum distance of 2 feet from the back of curb and a minimum depth of 2 feet shall be provided.

120.05.04 Yard hydrants may be installed within the median centerline of a divided roadway section if indicated on the proposed construction plans and given prior approval from the Town.

120.05.05 All street crossings of irrigation systems shall be encased in ductile iron or steel conduit.

120.05.06 Trench drains shall be required around any irrigated median and subdivision or site entrance.

120.05.07 The irrigation mainline pipe system shall be hydrostatically tested per Section 120.06 with a minimum pressure of 200-psi or 50-psi above working pressure, whichever is greater.

120.06 TESTING AND INSPECTIONS

120.06.01 General

120.06.01.01 All materials shall be approved by the Construction Inspector prior to installation. Materials rejected by the Construction Inspector shall be immediately removed from the job site.

120.06.01.02 Under no circumstance shall any waterline system valve be operated without prior approval by the Construction Inspector. Damage to Town infrastructure resulting from illegal operation of valves shall be the responsibility of the Contractor. In addition, the Contractor shall be subject to a fine for operating a valve without prior approval.

120.06.01.03 The Contractor shall furnish all materials, labor, and equipment to perform all testing and inspections to the satisfaction of the Construction Inspector. The Town shall provide water for testing purposes on water mains.

120.06.01.04 Upon completion of water main installation and prior to acceptance, the Contractor shall provide adequate and competent personnel to conduct, in conjunction with the Construction Inspector, an inspection of each valve and hydrant on the newly completed main. The purpose of this inspection shall be to insure the operability and location of each valve and to further insure that all valves are left in the open position.

120.06.01.05 Water service taps shall not be made until after all water main testing is completed, and bacteriological testing is satisfactory.

120.06.01.06 The Town's "Private Water Line / Fire Line Inspection Form" shall be completed and a copy provided to the Fire Department prior to a sprinkler system being connected to the fire line. Please see the Appendix for a copy of the form.

120.06.02 Hydrostatic Testing

120.06.02.01 No valve in the Town water system shall be operated without authorization from the Public Utilities Director or his designee. A section of line that is to be hydrostatically tested shall be slowly filled with water at a rate which will allow complete evacuation of air from the line. Once the line is full, it shall be blown off at a minimum of 2.5 FPS to flush and remove any debris. Hand pumps shall not be used for the pressure testing of water mains. Taps used for testing purposes shall be removed after testing and repaired using a stainless steel full circle repair clamp.

120.06.02.02 The line shall be tested to a pressure of 200 psi as measured at the highest elevation of the line for a duration of 2 hours. The pressure gauge used in the hydrostatic test shall be calibrated in increments of 10 psi or less. The pressure gauge shall be liquid-filled and indexed for an operating range of 300-psi or less with a minimum dial size of 3-1/2 inches. At the end of the test period, the leakage shall be measured with an accurate water meter.

120.06.02.03 All visible leaks are to be repaired regardless of the amount of leakage. The construction inspector may require pressure tests to be performed in smaller segments to determine if there is a problem with a particular section of waterline. No chlorine dosage will be allowed in line during testing.

120.06.02.04 See Table 120.02 for the maximum allowable leakage rates per pipe size. If circumstance is not shown in Table 120.02 use the following equation:

$$L = \frac{S * D * \sqrt{P}}{148,000}$$

L = allowable leakage (gallons per hour)

S = length of pipe tested (feet)

D = nominal diameter of pipe segment tested (inches)

P = test pressure (pounds per square inch)

120.06.02.05 Any measured leakage not within the allowable limits as specified in the following table shall require repair of the water main and additional testing until the standards are met. For pipe sizes other than those shown, the Contractor shall test within the allowable leakage amounts as specified by AWWA C600-99. All visible leaks shall be repaired regardless of the amount of leakage.

120.06.03 Chlorination

120.06.03.01 All additions or replacements to the water system shall be chlorinated before being placed in service under the supervision of the Construction Inspector as described below.

120.06.03.01.01 Taps shall be made near the control valve at the upstream end of the line and at all extremities of the line including valves.

120.06.03.01.02 A solution of water containing 70% HTH available chlorine shall be introduced into the line by regulated pumping at the control-valve tap. The solution shall be of such a concentration that the line shall have a uniform concentration of 100-ppm total chlorine immediately after chlorination. See Table 120.03 for the required approximate quantity of 70% HTH compound to be contained in solution in each 1000 feet section of line to produce the desired concentration of 100 ppm for given pipe sizes.

120.06.03.01.03 The HTH Solution shall be circulated in the main by opening the control valve and systematically manipulating hydrants and taps at the line extremities. The HTH solution shall be pumped in at a constant rate for each discharge rate so a uniform concentration will be produced in the mains. Note that for projects that are surrounded by populated development areas, the Construction Inspector can require that the circulation of HTH solution be accompanied with mechanical pumping.

120.06.03.01.04 The HTH solution shall remain in the lines for no less than 24 hours or as directed by the Construction Inspector.

120.06.03.01.05 Extreme care shall be exercised at all times to prevent the HTH solution from entering existing mains.

120.06.04 Bacteriological Sampling

120.06.04.01 All new water systems shall be valved off from the existing water system until a satisfactory bacteriological sample is obtained and the Construction Inspector has authorized the use of the new water system.

120.06.04.02 Free residual chlorine after 24 hours shall be at least 10 ppm or the Construction Inspector shall require that the lines be re-chlorinated.

120.06.04.03 Flushing of lines may proceed after 24 hours provided the free residual chlorine analysis is satisfactory. Flushing water shall be contained onsite without release to surface waters until a DPD chlorine reagent check shows that the lines and the water flushed from the lines contain only the normal chlorine residual. Alternative means of reducing the chlorine residual to acceptable levels prior to release to surface waters may be allowed with prior approval. Samples for bacteriological analysis shall be collected by the Construction Inspector 24 hours after flushing is completed. The Contractor shall furnish the sample bottles, the testing agency and such help as may be required to secure these samples. The contractor shall also submit the test results to the Construction Inspector.

120.06.04.04 If test results are unsatisfactory, the Contractor shall immediately re-chlorinate lines and proceed with such measures as are necessary to properly sterilize the lines.

120.06.04.05 The new water system shall be valved off from the existing system until a satisfactory bacteriological sample has been obtained and the Construction Inspector has authorized the use of the new water system.

120.07 REPAIR AND REHABILITATION

120.07.01 Mains

120.07.01.01 Joint leaks of Cast Iron Pipe, Ductile Iron Pipe, and PVC pipe shall be repaired by use of an approved bell joint leak repair clamp.

120.07.01.02 Line Breaks or Punctures shall be repaired by use of an approved full circle repair clamp.

120.07.01.03 Line Splits or Blow Outs shall be repaired by replacing the damaged section with ductile iron pipe with a cast iron coupling at each end. The cast iron couplings shall be material specific from manufacturers listed in the Approved Manufacturer's List.

120.07.01.04 All water main point repairs shall be replaced with DIP in accordance with these specifications and backfilled with crusher run stone compacted to 95% maximum dry density as specified elsewhere in the Standard Specifications.

120.07.02 Water Service Line Repairs

120.07.02.01 A water service line severed between the water main and the water meter shall be repaired using new type K copper tubing and bronze or brass 3 piece compression unions.

120.07.02.02 A corporation stop pulled out of a PVC pipe water main shall have a new service saddle and a new corporation stop installed on the water main.

120.07.02.03 A corporation stop pulled out of a ductile iron pipe shall have a full circle repair clamp placed over the old tap hole. A new tap shall be made, using a new service saddle, and a new corporation stop installed on the water main.

120.07.02.04 Abandonment of water services shall be completed back to the corporation stop at the water main. For direct taps the tap shall be removed and a repair band installed.

Table 120.01 - Water Meter Sizing			
Meter Size (inches)	Flow Range (GPM)	Load Range (number of fixture units)	
		Supply Systems Predominately for Flush Tanks	Supply Systems Predominately for Flush Valves
¾ PD	0-20	1-22	1-8
1 PD	20-50	22-140	9-50
1½ PD	50-100	140-450	50-275
2 C	100-200	450-1000	275-1000
3 C	200-400	1000-2500	1000-2500
4 C	400-600	2500-5000	2500-5000

PD = Positive Displacement
 T = Turbine (may be required on a case-by-case basis)
 C = Compound (shall be sized on a case-by-case basis)

Table 120.02 - Maximum Leakage Allowed with Hydrostatic Testing	
Pipe Size (inches)	Allowable Leakage at 200-psi (gal./hr. per 1000 feet of pipe)
6	0.64
8	0.85
10	1.06
12	1.28
16	1.70
20	2.12
24	2.55

Table 120.03 - Required Hypochlorite Concentration	
Pipe Size (inches)	Pounds High Test Hypochlorite (70%) per 1000 feet of line
6	1.76
8	3.12
10	4.84
12	7.00
14	9.52
16	12.44
20	19.52
24	28.00