

SECTION 06000
WATER DISTRIBUTION SYSTEMS

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06010 WATER DISTRIBUTION PIPE

A. DESIGN

1. The following Standard Specifications and associated Detail Drawings shall apply to all water system extensions and development of the Cary municipal water system. The Standard Specifications and Detail Drawings included herein shall apply to all aspects of the Cary water system that extend into Morrisville, RTP, Wake County and any other areas outside the corporate limits in which the water system is otherwise owned, operated and maintained by the Town of Cary.
2. Location: 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. All public water mains shall be located within dedicated right of way or dedicated easements with a minimum width of 20 feet. Dedicated easements for water mains and appurtenances shall be recorded as "Town of Cary Utility Easement." Town of Cary water easements shall contain only Town of Cary utilities unless otherwise approved by an encroachment agreement. See Section 02100 for allowable landscape plantings within a Town easement.
3. No permanent structures, equipment, retaining walls, embankments, impoundments, or other elements that would inhibit maintenance operations shall be constructed within a water main easement unless a written request for waiver is approved by the Director of Engineering. The request for waiver shall describe all special conditions and include all appropriate measures to assure protection of the water main and access for maintenance. Fences may be allowed across easements provided that appropriate access gates have been installed to allow utility maintenance. Fill or cut slopes greater than 5:1 are not allowed to extend into easements except by specific approval of the Director of Engineering.
4. Sizing: Major transmission lines shall be sized in accordance with the "Water System Master Plan" or as directed by the Town. Six (6) inch mains may be used only when a good grid exists. The total maximum length of 6 inch and 8 inch lines, without connecting to a larger main, is 1200 feet and 2000 feet, respectively. Four (4) inch water mains are permitted on residential cul-de-sacs less than 400 feet long. Where a good grid does not exist, lines shall be upsized to provide adequate fire flow as directed by the Director of Engineering. All lines shall be designed in accordance with Policy Statement 129, Minimum Water Supply Pressure.

5. Installation:

- a) All utility extension permits must be obtained prior to construction. Refer to General Provisions in Section 02000 for further requirements.
- b) All water mains shall have a minimum cover of 4 feet measured from the top of the pipe to the finished grade. When water lines are installed along a roadway they shall be installed at sufficient depth to maintain four (4) feet of cover to the subgrade of any future road improvements including potential vertical alignment changes.

6. Restraint: All water distribution mains in the Town of Cary water system shall be restrained. The standard joint restraint shall consist of stainless steel rodding and blocking as specified herein. All valves shall be restrained in a manner consistent with operation as a dead end, which includes restraining the valve to the pipe and restraining a sufficient number of pipe joints on both sides of the valve to accommodate dead end valve restraint. The specifications allow for several options to achieve required pipeline restraint, such as wedge action retainer glands, rods, blocking, manufacturer provided restrained joint pipe, concentric ring fittings, etc. All joint restraint products that include the means of restraint within the joint gasket shall be prohibited in the Town of Cary water system.

All plans submitted shall include the pipe restraining plan including the number of joints restrained at fittings, valves, etc. Project designers shall include sufficient detail on the plan and profile drawings that make it clear to contractors what is required to meet the engineered restraining system specified. The pipe restraint plan shall be included under the design responsibility of the NC Professional Engineer sealing the plan drawings. Restraining systems not included within this specification shall require approval from the Town of Cary prior to utilization.

7. Relation to Sanitary, Storm Sewers and Reclaimed Water Lines:

- a) Separation between Potable Water Mains and Sanitary Sewer Mains or Storm Sewers.
 - Parallel Installations: 10-ft lateral separation (pipe edge to pipe edge) or minimum 3-ft lateral separation, and water line at least 18-inches above sanitary sewer line measured vertically from top of sewer pipeline to bottom edge of water main. In unique cases where the sanitary sewer and the water main are installed with at least 3-ft of lateral separation but less than 10-ft of horizontal separation, and less than 18-inches of vertical separation, both the water main and sanitary sewer shall be constructed of ductile iron pipe with joints in full compliance with water main standards.

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- Crossings (Water Main Over Sewer): All water main crossings of sewer lines shall be constructed over the sewer line in conformance with Town of Cary specifications. At a minimum, 18-inches of clearance shall be maintained between the bottom edge of the water main and the top edge of the sewer main. If 18-inches of clearance is not maintained, the water main and sanitary sewer main shall both be constructed of ductile iron pipe with joints in conformance with water main construction standards. The sanitary sewer pipe shall be ductile iron the entire run from manhole to manhole. When the separation between pipelines is 18-inches or less, the void space between the pipes shall be filled with minimum 500-psi, quick setting, non-excavatable flowable fill extending 3-ft on both sides of the crossing. Regardless of pipe material, at least 12-inches of vertical separation is required for both sanitary and/or storm sewer crossings of potable water mains.
- Crossings (Water Main Under Sewer Line): Allowed only as approved by Town of Cary, when it is not possible to cross the water main above the sewer line. At a minimum, 18-inches of separation shall be maintained, (measured from pipe edge to pipe edge) and both the water main and sanitary sewer shall be constructed of ductile iron in conformance with water main construction standards. The sanitary sewer pipe shall be ductile iron the entire run from manhole to manhole. If local conditions prevent providing 18-inches of clearance, then at least 12-inches of clearance shall be provided and the void space between the pipes shall be filled with minimum 500-psi, quick setting, non-excavatable flowable fill extending at least 3-ft on both sides of the crossing.

b) Separation between Potable Water Mains and Reclaimed Water Mains

- Parallel Installations: Preferred 10-ft lateral separation (pipe edge to pipe edge) AND water line at least 18-inches above reclaimed water line measured vertically from top of reclaimed water pipeline to bottom edge of water main. Because all reclaimed water mains in the Cary municipal system are required to fully comply with water system testing and integrity standards as described by 15A NCAC 18C, when the 10-ft lateral separation standard cannot be met, a minimum of 3-ft lateral separation, shall be provided.
- Crossings (Water Main Over Reclaimed Water Pipeline): All water main crossings of reclaimed water mains shall be constructed over the reclaimed water line in conformance with Town of Cary specifications. At a minimum, 18-inches of clearance shall be maintained between the

bottom edge of the water main and the top edge of the reclaimed water main. When the minimum 18-inch clearance cannot be maintained, the reclaimed main shall be constructed of ductile iron pipe in conformance with water main construction standards extending at least 10-ft on both sides of the crossing. The void space between the pipes shall be filled with minimum 500-psi, quick setting, non-excavatable flowable fill extending at least 3-ft on both sides of the crossing. Reclaimed water mains crossing under potable water service lines may be constructed of either C900 or C905 PVC as typically required for reclaimed water pipeline construction.

- Crossings (Water Main Under Reclaimed Water Pipeline): Allowed only as approved by Town of Cary. At a minimum, 18-inches of separation shall be maintained and both potable water and reclaimed mains shall be constructed of ductile iron pipe in conformance with water main construction standards extending at least 10-ft on both sides of the crossing. If local conditions prevent 18-inches of clearance between the pipelines, the void space between the pipes shall be filled with minimum 500-psi, quick setting, non-excavatable flowable fill extending at least 3-ft on both sides of the crossing.

B. MATERIALS

1. General: All water main distribution pipe shall be ductile iron. The Engineering Department will maintain a list of approved manufacturers for all water distribution products. New manufacturers must submit requests for approval to the Engineering Department in accordance with Standard Procedure 120, Manufacturer Approval Guidelines.
2. Ductile Iron Pipe
 - a) Ductile iron pipe shall be designed and manufactured in accordance with AWWA C150 and C151 and provided in nominal 18-ft or 20-ft lengths. The minimum required pressure ratings for ductile iron pipe and required laying conditions are tabulated below. For all other installations other than specified, the laying condition, bedding requirements or the minimum pressure class rating and/or thickness class shall be increased in accordance with AWWA C151. A pipe thickness design shall be submitted for external loading in all cases where the pipe depth exceeds the specified range of depths outlined in the following table.

Pressure Class, Max. Depth and Laying Condition for DI Water Mains

Pipe Diameter	AWWA C-150, Laying Condition	Pressure Class	Maximum Depth of Cover
4-8 -inch	type 1	350 psi	3-16 feet
4-8 -inch	type 4	350 psi	16-34 feet
10-12 -inch	type 1	350 psi	3-10 feet
10-12 -inch	type 4	350 psi	14-28 feet
10-12 -inch	type 5	350 psi	28-44 feet
14-20 -inch	type 4	250 psi	3-22 feet
14-20 -inch	type 5	250 psi	22-30 feet
14-20 -inch	type 5	350 psi	30-41 feet
24-30 -inch	type 4	250 psi	3-19 feet
24-30 -inch	type 5	300 psi	19-29 feet
24-30 -inch	type 5	350 psi	29-33 feet
36-42 -inch	type 4	300 psi	3-20 feet
36-42 -inch	type 5	350 psi	20-32 feet

Note: For cases not specified, a ductile iron pipe and bedding design certified by a Professional Engineer licensed in the State of North Carolina shall be required in compliance with AWWA C150 and the Ductile Iron Pipe Research Association.

- b) Pipe joints shall be mechanical joint or push-on type as per AWWA C111. Pipe lining shall be cement mortar with a seal coat of bituminous material in accordance with AWWA C104. All buried ductile iron pipe shall have a bituminous exterior coating in accordance with AWWA C151.

3. Ductile Iron Fittings

All ductile iron fittings shall be provided in conformance with AWWA C110 for standard ductile iron fittings and AWWA C153 for compact ductile iron fittings. All fittings shall be pressure rated for a minimum 350-psi through 24-inches in diameter and 250-psi for fittings greater than 24-inches in diameter. In cases where minimum pressure standards are less than the pipe specification, fittings shall always be pressured rated to meet or exceed the pressure ratings for the specified pipe. All fittings for potable water service shall be provided with cement mortar linings and asphaltic seal coats in accordance with AWWA C104. All ductile iron fittings shall have an asphaltic exterior coating in accordance with AWWA C151. All DI fittings shall be provided with mechanical joint end connections and restrained with standard blocking and rodding or wedge action retainer glands, unless otherwise specified with more

stringent restrained connections approved by the Town. Gaskets shall be provided in conformance with AWWA C111 with EPDM rubber gaskets preferred over SBR.

4. Restrained Joint Ductile Iron Pipe

All restrained joint ductile iron pipe unless otherwise specified shall be of the boltless restrained joint type as assembled with a steel flexible ring that locks into position inside the bell of the connecting pipe. The locking rings shall be one-piece construction. For installations requiring welded locking rings, the rings shall be factory welded. The restrained joints shall provide a minimum of 4-degrees of deflection for pipe sizes, 4-inches through 12-inches in diameter.

All proprietary pipe restraint systems shall be approved by the Town of Cary and provided in compliance with all standards for coatings, linings, pressure classes, etc. as required for ductile iron pipe. All restrained joint pipe shall be installed based on laying conditions, pressure class, etc. as required for typical ductile iron pipe.

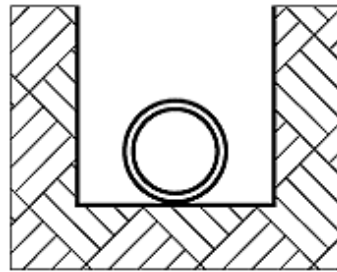
C. INSTALLATION

1. Ductile iron pipe shall be installed in accordance with the requirements of AWWA C600 and the Ductile Iron Pipe Handbook published by the Ductile Iron Pipe Research Association. Materials at all times shall be handled with mechanical equipment or in such a manner to protect them from damage. At no time shall pipe and fittings be dropped or pushed into ditches.
2. Pipe and fitting interiors shall be protected from foreign matter and shall be inspected for damage and defects prior to installation. In the event foreign matter is present in pipe and fittings, it shall be removed before installation. Open ends of pipe shall be plugged or capped when pipe laying is not in progress.
3. All pipe shall be constructed with at least 48 inches of cover below the finished surface grade. Pipe shall be laid on true lines as directed by the Engineer. Trenches shall be sufficiently wide to adjust the alignment. Bell holes shall be dug at each joint to permit proper joint assembly. The pipe shall be laid and adjusted so that the alignment with the next succeeding joint will be centered in the joint and the entire pipeline will be in continuous alignment both horizontally and vertically. Pipe joints shall be fitted so that a thoroughly watertight joint will result. All joints will be made in conformance with the manufacturer's recommendations for the type of joint selected. All transition joints between different types of pipe shall be made with transition couplings approved on shop drawings showing the complete assembly to scale.

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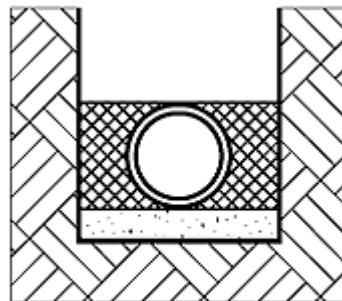
4. Pipe shall be installed at laying conditions as specified by the plans. Laying conditions for ductile iron pipe shall be as described in AWWA C151 and the Ductile Iron Pipe Research Association. Laying conditions shall be defined as follows:

Type 1: Flat Bottom Trench with Pipe Resting on Stable Undisturbed Earth. Unstable conditions such as wet trench bottoms, intermediate rock layering, partially weathered rock, and other unsuitable soil conditions shall require utilizing more stringent laying conditions. At a minimum, Type 4 laying condition shall be utilized with a minimum of 4-inches of bedding to overcome unstable conditions. For severe unstable soil conditions, undercut excavation and an engineer designed foundation plan shall be provided prior to pipeline installation.



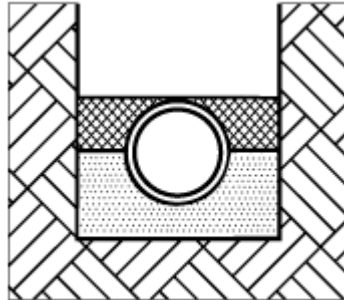
Type 1*

Type 4: Pipe bedded in Class 1 material, No. 67 or No. 78 crushed stone to a depth of 1/8 pipe diameter or a minimum of 4-inches. Embedment material, consisting of Class 1, Class 2 or Class 3 materials, (as defined in Section 7000), shall be compacted greater than 95% Proctor to the top of the pipe. Careful attention must be allocated to compacting embedment material under the bottom edges of the pipe.



Type 4

Type 5: Pipe bedded in Class 1 material, No. 67 or No. 78 crushed stone to the center of the pipe and extending a minimum of 4-inches under the pipe. Granular or select embedment, consisting of Class 1 or Class 2 materials, compacted to greater than 95% Proctor installed to the top of the pipe.



Type 5

5. 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.
6. Valves in the existing Town of Cary water system shall not be operated without a minimum notice of 24 hours to the Engineer and the Public Works and Utilities Department. All valves that are under the ownership and acceptance of the Town of Cary municipal water system shall be operated only by trained personnel of the Town of Cary. Contractor's personnel shall only be responsible for operating valves within new construction areas that are not directly connected with the existing municipal water supply. At such time when the valves in new construction areas are connected with the municipal water supply, the valves shall only be operated by Town of Cary personnel or in limited circumstances by contractor's personnel after receiving authorization from the Operator in Responsible Charge of the water distribution system. For all other cases, the Contractor shall operate valves only in accordance with Town of Cary Policy Statement No. 49, Control and Operation of Valves and Fire Hydrants.

06020 FIRE PROTECTION

A. FIRE HYDRANTS

1. Location

- a) All fire hydrants shall be installed on a minimum 6 inch water line. Only one fire hydrant may be installed when the line is served by a 6 inch tap and is not looped to another main. There shall be at least one fire hydrant at each street intersection. The minimum acceptable flow for fire hydrants is 1000-gpm at minimum 20-psi residual in residential areas and 1500-gpm at minimum 20-psi residual in other districts. Hydrants at intersections shall be located in accordance with the Standard Details. Valves provided on the fire hydrant branch supply line shall be located within 5-ft of the main line.
- b) In residential districts the maximum distance between hydrants, measured along street centerlines, shall be 500 feet. When residential intersections are less than 700 feet apart, a hydrant is not required between the intersections.
- c) In business, office and institutional, and industrial zoning the maximum distance between hydrants, measured along street centerline, shall be 300 feet. When business, office and institutional, and industrial intersections are less than 450 feet apart, a hydrant is not required between intersections
- d) On major thoroughfares and collector streets with access points only at street intersections, hydrants shall be located at each street intersection and at 1000 foot intervals along the street. Where these intersections are less than 1200 feet apart, no hydrant is required between the intersections. Fire hydrants shall be placed in a staggered arrangement on both sides of any roadway classified as a major or minor thoroughfare with the hydrant spacing as referenced above. New buildings, or additions which result in a total building area of 10,000 square feet, require hydrants to be installed at 300 foot intervals along all sides of the building that are accessible to fire pumpers. These hydrants shall be at least 40 feet away from the building. The total number of hydrants shall not exceed one hydrant per separation of buildings plus one hydrant per 10,000 square feet of floor space.
- e) Where sprinkler systems are used, a fire department connection shall be within 50 feet of an accessible fire hydrant. See Section 06020 B for other sprinkler system requirements.

2. Specifications: Hydrants shall conform to AWWA C502 with a minimum valve opening of 4 1/2 inches. Hydrants shall be furnished with a 4 1/2 inch steamer* and double 2 1/2 inch hose connections with caps and chains, National Standard Threads, mechanical joint, 1 1/2 inch pentagon operating nut, open left, painted fire hydrant red, bronze to bronze seating, a minimum 4 foot bury depth with a break away ground line flange and break away rod coupling. The hydrant bonnet will be designed with a sealed oil or grease reservoir with O-ring seals and a Teflon thrust bearing. Fire hydrant caps shall be attached to the body of the hydrant with a minimum 2/0 twist link, heavy duty, non-kinking, machine chain. All fire hydrants shall be designed and rated for a working pressure of 250-psi or greater.

* For hydrants located within the Town of Morrisville only: Where Fire Department Connections are provided to buildings, the hydrant closest to the FDC shall be supplied with a 5 inch Storz connection in lieu of the 4 1/2 inch steamer connection. The Storz connection shall be by the hydrant manufacturer only and come as part of the hydrant assembly. No adapters for the Storz connection are allowed.

3. Installation: Hydrants shall be set plumb, properly located with the pumper nozzle facing the closest curb of a fire lane or street, but not a parking space. The back of the hydrant opposite the pipe connection shall be firmly blocked against the vertical face of the trench with 1/3 cubic yard of concrete. Double bridle rods and collars shall be connected from the tee to the hydrant. Rods shall not be less than 3/4 inch diameter and made of stainless steel rod stock for corrosion protection. A minimum of 8 cubic feet of stone shall be placed around the drains. The backfill around the hydrants shall be thoroughly compacted and closely match the elevation on the approved plans. Hydrant extensions will not be allowed on new or retrofit installations. Hydrant installation shall be in accordance with the Details. Hydrant tees and mechanical restraints may be used upon approval of the Engineering Department.

For fire hydrant installations outside of intersections, the Contractor may choose to utilize concentric ring restrained fittings in combination with concentric ring restrained gate valves and fire hydrants without typical blocking and rodding. In this case, the entire hydrant supply line shall be fabricated with restrained joints. The Contractor may also elect to utilize typical mechanical joint fittings, restrained with wedge action retainer glands. The wedge action retainer glands, shall be installed on all sides of the mechanical joint branch fitting, both sides of the valve, and the fire hydrant to restrain any mechanical joint pipe connections on the hydrant supply line.

4. Depth of Bury:

Typical 90-Degree Hydrant Shoe Installations:

The maximum depth of bury for all new fire hydrants with 90-degree hydrant shoes shall be 5-ft from the breakaway flange connection. The breakaway flange or safety coupling shall be oriented vertically just above finished grading and bolted directly to the fire hydrant in compliance with manufacturer standards. The breakaway flange or safety coupling shall not be buried.

Vertical Shoe Hydrant Installations:

For installations requiring depth of bury greater than 5-ft, the fire hydrant shall be equipped with a vertical shoe arrangement that provides for full extension of the lower valve plate against a stopping mechanism located inside the vertical shoe to maximize hydraulic flow conditions through the hydrant. The vertical shoe shall be equipped with flanged connections. The maximum depth of bury for vertical shoe installations shall not exceed 4-ft measured from the breakaway flange to the bottom of the vertical hydrant shoe. The vertical shoe and all piping included in the hydrant supply line shall be restrained with blocking and rodding or blocking with wedge action retainer glands or standard Aquagrip connections.

In all cases where the vertical shoe is utilized, typical washed stone bedding extending at least 12-inches on all sides of the central axis and extending from the top of the vertical shoe downward to at least 12-inches below the vertical shoe shall be provided surrounding the vertical hydrant shoe assembly to assure positive drainage. In cases where Aqua-grip connections are not utilized, piping below the vertical shoe shall be provided in a flanged by plain end configuration and restrained with wedge action retainer glands to the lower mechanical joint fitting or the lower fitting shall be blocked and rodded to the vertical shoe connection. The entire assembly shall be restrained and support blocking shall be provided under the vertical bend assembly.

5. Hydrant Relocations: For installations where hydrants will be relocated, all hydrants with greater than 12-years of operational service, as indicated by the date of manufacture provided on the hydrant, shall be replaced with new fire hydrants. The existing fire hydrant shall be turned over to the Town of Cary Public Works Department.

B. AUTOMATIC FIRE SPRINKLER SYSTEMS

1. General: Four (4) complete sets of working plans and calculations for all fire sprinkler systems and standpipe systems shall be submitted as required by the Inspections and Permits Department for review and approval. If 20 sprinkler heads or more are modified or added to an existing sprinkler system,

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if any modifications occur in the hydraulically calculated remote area, or the hazard classification changes, a plan submittal including complete calculations and a permit will be required. All fire sprinkler systems shall be installed with an alarm check valve installed in each riser with all required appurtenances (example: retard chamber, water motor gong, pressure gauges, etc.). Exception: NFPA 13 D and 13 R residential sprinklers when approved by a fire official. All installations, minor repairs, or minor replacements shall be performed by a licensed fire sprinkler contractor. Contact the Inspections and Permits Department for a permit application.

2. Design: Approved working plans shall be in complete compliance with NFPA No. 13, 13D, 13R, 14, 231, 231C, 231D, 231F and Town Specifications. An NFPA above ground material and test certificate and NFPA underground material and test certificate are required after completion of designated, approved work.
3. Hydraulic Design: If a system is hydraulically designed, the following design criteria must be followed:
 - a) Safety Margin: In all cases, a fixed minimum safety margin of at least 10-psi shall be applied to the design calculations. (Example: Demand = 70 psi, Supply \geq 80 psi)
 - b) Hose Allowances: Both exterior and interior hose allowances shall comply with NFPA 13 requirements.
 - c) Water Supply Pressure: The sprinkler system designer shall be responsible for verifying system pressure. Refer to Town of Cary Policy Statement 129 regarding Minimum Water Supply Pressure.
4. Backflow Prevention: When a fire protection system is proposed, with a Fire Dept. connection or as otherwise required by the Cross Connection Ordinance a reduced pressure principle detector assembly (RPDA) shall be installed on the supply side of the sprinkler fire protection line. These backflow prevention devices must be UL listed and/or listed by Factory Mutual Research Corporation. Reduced pressure principle detector assemblies shall not be arranged vertically. For all RPDA's, a relief valve fill cup piped outside the building shall be provided. The relief valve drain may be piped to the main building drain.
5. Post Indicator Valve: A post indicator valve with electronically controlled tamper switch shall be provided at the right of way or edge of easement (preference: listed indicating valves at each connection into the building at least 40 feet from building if space permits). The top of the PIV shall be 36 inches above finished grade and 36-inches of unobstructed access perimeter shall be maintained around the PIV. The Town shall maintain up to the post

indicator valve. All PIV(s) shall be made of DIP construction and shall be UL listed and FM approved. The stand pipe of all PIV's shall be painted red.

6. Fire Department Connection: Where automatic fire sprinkler systems or standpipe systems are used, a fire department connection with National Standard threads shall be provided within 50-ft of a fire hydrant, except for town homes and apartment buildings. When a sprinkler system serves only part of a large structure, the fire department connection shall be labeled, with minimum 2 inch letters on a permanent sign, as to which section of the structure that sprinkler riser serves
7. Dedicated Riser Room: A dedicated sprinkler riser room is required providing an entry door to the room from the exterior of the building. All dedicated riser rooms shall be equipped with a floor drain sized appropriately to prevent flooding. The floor drain shall be piped to storm system or main building drain. The floor drain shall be provided with a circular raised ring/hub around the floor drain to prevent debris and/or chemicals from entering the drain during an emergency spill. The hub shall be fabricated of cast iron or other corrosion resistant material and extend at least 3-inches above floor elevation.
8. Alarm Communication: All sprinkler systems are to have alarm communication equipment to fully comply with NFPA 72. Equipment must be fully functional and reporting to a UL listed central receiving station before a Certificate of Occupancy is issued for the facility.
9. Access: All buildings which have a fire alarm system monitored by a central receiving station or a fire sprinkler protection system shall provide a "Knox Box" key entry system. This "Knox Box" shall be mounted on the exterior entrance to the dedicated riser room. Mount "Knox Box" on wall at 5 feet A.F.F. on door handle side of dedicated riser room door. This "Knox Box" shall be ordered through the Town Fire Department and shall be in place before a Certificate of Occupancy is issued. Forms are available from the Fire Department. Average delivery time is 5 to 6 weeks. Keys to access the facility shall be provided to the Fire Department by the owner/manager.
10. Identification: The exterior door leading to the dedicated sprinkler riser room shall be labeled with minimum 2 inch lettering designating "SPRINKLER RISER ROOM" in a contrasting color. Durable vinyl lettering is suggested.
11. Fire Alarm Panel Location: When a building is protected by an automatic sprinkler system and has a fire alarm system, the fire alarm control panel or a remote annunciation of the fire alarm control panel shall be placed in the sprinkler riser room. This control panel shall have the capacity of silencing and resetting. Adjacent to the fire alarm control panel shall be a framed zone map. Nomenclature shall correspond with the zone map. Submit four

complete sets of plans and specifications to the Inspections and Permits Department for approval prior to installation of equipment or wiring.

C. FIRE PROTECTION DURING CONSTRUCTION

1. The fire protection water supply system, including fire hydrants, shall be installed and be in at least the functional status prior to placing combustible materials on the project site. If phased construction is planned, coordinated installation of the fire protection water system is permitted. Coordination of the water system will be done through the Engineering Department. Functional status would include meeting all standards set forth in Section 06060 "Testing and Inspections".

06030 VALVES AND APPURTENANCES

A. VALVES

1. General

- a) Valves shall be installed on all branches from feeder mains and hydrants according to the following schedule: 3 valves at crosses; 2 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 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.
- b) 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.
- c) 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

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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 8 feet without an extension kit. When valve extension kits are used, they must be manufactured by the same company which manufactured the valve.

2. Combination air valves

- a) Combination air valves shall be provided to purge air from the system at startup, vent small pockets of air while the system is being pressurized and running, and prevent critical vacuum conditions during draining. Combination air valves rated for potable water use shall be installed at all high points of water lines 8 inches in diameter or larger and at other locations such as major changes in grade as directed by the Town. A high point shall be determined as any high location where the difference between the high elevation and adjacent low elevation exceeds 10-ft, unless otherwise determined by the Director of Engineering based on special circumstances.

All combination air valves shall be provided in conformance with AWWA C-512. The combination air valve shall automatically exhaust large volumes of air from the system when it is being filled and allow air to re-enter the pipe when the system is being drained. 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 should be maintained.

- b) The combination air valve shall be sized by the Engineer, and approved by the Town. Combination air valves shall be of the single housing style with Type 304 or 316 stainless steel body 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 the inlet body shall be rated for minimum 230 PSI working pressure. Combination air valves sized from 2-inches to 4-inches shall be provided with NPT inlets and outlets unless otherwise submitted for approval with flanged connections. The combination air valve shall be provided with cylindrical shaped floats and anti-shock orifice made of high density polyethylene. Combination air valves with spherical floats shall not be accepted. All combination air valves shall be installed in accordance with the Details.
- c) The combination air valve shall be installed in standard eccentric manhole as specified in Section 7000 and shown in the detail drawings. All combination air valve assemblies shall be provided with a saddle tap in the same sizing as the combination air valve assembly and isolated with a gate valve of the same size. The isolation gate valve shall be provided with NPT threads and connected with "no lead" brass (meeting UNS

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C89833 as per ASTM B584) or bronze piping. “No lead” brass or bronze ball valves may be used in lieu of gate valves for installations 2-inches or smaller. The isolation valve shall be rated for 200-psi service or greater.

3. Gate Valves, Less than 4-inches for Blowoff Assemblies

Gate valves for blowoff installations sized smaller than 4-inches, shall be resilient seated wedge type with a non-rising stem and a 2 inch operating nut in compliance with AWWA C509. The smaller diameter gate valves shall be provided with triple O-ring seals and threaded end connections in compliance with ANSI B2.1. Gate valves smaller than 2 inches shall be identified “no lead” and consist of brass components designated under UNS C89833 as per ASTM B584. The small diameter gate valves shall be rated for a minimum pressure rating of 200-psi.

4. Gate Valves, 4-inches to 12-inches

All valves for potable water applications, 12-inches in diameter and smaller shall be resilient seated wedge gate valves in conformance with the requirements of AWWA C509, (grey or ductile iron body) or AWWA C515, (reduced wall ductile iron body). All coatings materials used in the construction of gate valves for potable water applications must comply with NSF 61 to assure lead free construction. All gate valves shall be designed for a working pressure of 250-psi with a minimum ULFM rating of 200-psi. Gate valves shall be fusion bonded epoxy, (FBE) coated both interior and exterior at a minimum of 10mils and the FBE coating shall be provided in conformance with AWWA C550.

All gate valves 12-inches in diameter and smaller shall be installed in the vertical position and shall be provided with mechanical joint fittings. Gate valves shall be restrained by stainless steel rodding, concentric ring restrained connections or wedge action retainer glands. In all cases, the valve and piping shall be restrained on both sides to sufficiently allow the valve to function as a dead end.

All gate valves shall open left with a non rising stem and be provided with a 2-inch square operating nut. All gate valves shall be constructed with triple o-ring seals in which 2 o-rings are located above the thrust collar and 1 o-ring is located below the thrust collar. The two upper o-rings shall be replaceable with the valve fully open and subjected to full rated working pressure.

The gate valve wedge shall be fully encapsulated in rubber. All valves shall be rated for bi-directional flow. All sealing gaskets shall be made of EPDM rubber materials.

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5. Gate Valves, 16-inches through 24-inches

Gate valves 16-inches through 24-inches shall comply with all specifications outlined for gate valves 12-inches and smaller in the previous section, including the 250-psi pressure rating. Gate valves 16-inches through 24-inches shall be fabricated exclusively with ductile iron construction in conformance with AWWA C515.

As additional requirement, gate valves 16-inches through 24-inches if installed vertically, shall be provided with a minimum of 2-ft of overhead clearance between the top of the operator nut and the finished subgrade.

Vertical gate valve installations sized from 16 through 24 inches in diameter shall be provided with a spur gear operator at a 4:1 ratio.

Gate valves, sixteen (16) inches and larger, installed in a horizontal position, shall only be provided, as permitted by the Director of Engineering for special circumstances where vertical alignment is not possible. All horizontal gate valves shall meet or exceed the specifications outlined herein for vertical gate valves including the 250-psi pressure rating. All horizontal gate valves shall be equipped with bevel gears resulting in 4:1 or 6:1 turn ratios through 42-inches in diameter.

6. Butterfly Valves: Butterfly Valves shall not be used in the Town of Cary water system unless permitted by the Director of Engineering in unique cases where a gate valve cannot be installed. 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' (measured to top of pipe) shall be installed in a manhole as shown in the Details. Valves designated by the TOC to potentially have a remote actuator shall be installed in a manhole as shown in the Details. All butterfly valves shall be rated for a working pressure of 200-psi or greater. Butterfly valves shall be provided with a fusion bonded epoxy coating on both interior and exterior surfaces at a minimum of 10-mils with an NSF 61 approved epoxy. All rubber seals and gaskets shall be made of EPDM rubber.

7. Insertion Valves: Insertion valves shall only be used as permitted by the Engineering Department. Insertion valves shall be fabricated to ensure a full circumferential seal around the main line and rated for a test pressure of 225-psi or greater. All insertion valves shall be made of fabricated steel in conformance with ASTM A-36 and epoxy coated at a minimum of 10-mils. Insertion valves are available for pipe sizes through 24-inches in diameter. In cases where insertion valves are being installed to shut down water to a work zone area, the insertion valve shall be located a minimum of 100-ft from the

work zone or greater as determined by the Engineer of Record to assure the insertion valve can safely operate as a dead end without dislodging from the pipeline or otherwise causing the existing pipeline to shift.

8. Valve boxes

- a) 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 gray iron and domestically made and manufactured in the USA.
- b) Valve box ring adjustments will 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' x 2' x 6" 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.

9. Actuators: All valves shall be provided with standard 2-inch operating nuts. 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.

B. APPURTENANCES

1. Blowoffs:

- a) 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.
- b) 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 gate valve is required on water mains that are planned to be extended.
- c) Blowoff Assemblies installed in cul-de-sacs with 4-inch water mains not planned for roadway extension may be constructed with a self-contained blowoff assembly as shown in the detail drawings.

2. Reaction Blocking: Thrust restraint blocking for all fittings or components subject to hydrostatic thrust shall be securely anchored by the use of concrete

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thrust blocks poured in place. The reaction areas are shown in the Details. No concrete shall interfere with the removal of fittings. Material for reaction blocking shall be 3000 psi concrete. A minimum 4 mil plastic shall cover the fitting to ensure that no concrete will interfere with removal of the fitting. Alternative restraining methods and mechanical joint restraints may be used upon approval by the Director of Engineering.

3. Rodding: All rodding shall be constructed with type 304 stainless steel rods at the number and sizing specified in the following table. Rod coupling shall not be allowed.

Stainless Steel Rod Requirements are as follows:

4-inch branch	2, ¾-inch steel rods
6-inch branch	2, ¾-inch steel rods
8-inch branch	4, ¾-inch steel rods
12-inch branch	6, ¾-inch steel rods
16-inch branch	8, ¾-inch steel rods
24-inch branch	10, ¾-inch steel rods

4. Wedge Action Retainer Glands:

Wedge action retainer glands may be used as a substitute for rodding, but shall not substitute for typical reaction blocking. All wedge action retainer glands shall be manufactured as a one piece retainer gland for use with mechanical joint fittings and shall be rated to provide restraint up to 350-psi pressure rating for sizes through 16-inches. For sizing above 16-inches, the wedge action retainer gland shall be rated to provide restraint up to 250-psi. Approved wedge action retainer glands shall be made of ductile iron, coated with a manufacturer applied epoxy coating or polyester powder coating.

In cases where wedge action retainer glands are approved for pipe restraint of fire hydrant supply lines or other applications, the wedge action retainer gland shall be joined with a mechanical joint pipe bell and the entire hydrant supply line shall be restrained.

Wedge action retainer gland connections to push on pipe are not approved.

5. Sampling Stations:

Sampling Stations shall be provided at all new residential and commercial development areas at the rate of 1 sampling station per development complex consisting of at least 200-homes or 1- per 10 acre or greater commercial complex or 1 per institutional facility with more than 100,000 square feet or as otherwise required by the Director of Engineering. Padlocks for sampling stations shall be provided by the Town of Cary Public Works Dept. The sampling station requirement may be waived in cases where area sampling is already deemed sufficient by the Water System Operator.

Sampling stations shall be provided as a self-contained manufactured assembly with locking aluminum housing, copper drainage tube and unthreaded spigot.

06040 WATER SERVICE TAPS

A. DESIGN

1. 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 unless otherwise approved by the Director of Engineering. All connections shall be made by wet taps. Service connections shall be made perpendicular to the main and shall run straight to the meter.
2. All water service lines shall be installed with a minimum depth of cover of 24-inches or greater.
3. All water meter boxes and vaults shall be located at the edge of the serviced lot's right of way or easement. Water meter boxes shall not be placed in streets, sidewalks, parking areas or obstructed by fencing or buildings. Exceptions to these conditions will be at the direction of the Director of Engineering.
4. Provisions for backflow prevention shall be in accordance with existing Town policies and the NC Plumbing Code.
5. The water meter shall be sized based on water demand. All water service lines shall be minimum 1 inch diameter. Multiple branches up to a maximum of 2 potable water services per multiple branch assembly for residential use shall be sized by the engineer of record in accordance with AWWA M22, but shall not be less than 1.5-inches in diameter.
6. Service taps 2 inches or less to existing water lines shall be made by the Town. Service taps greater than 2 inches to existing water lines shall be made by a Contractor of the Developer after obtaining applicable permits and paying applicable fees.
7. Service taps to new water lines shall be made by the Contractor in accordance with the specifications after obtaining applicable permits and paying applicable fees.

B. MATERIALS

1. Tapping Sleeves: Mechanical Joint Tapping Sleeves: MJ tapping sleeves shall be fabricated of ductile iron construction in a two-piece assembly with mechanical joint connections to the main line and flanged connection to the tapping valve. All MJ tapping sleeves shall be rated for a working pressure of 200-psi or greater and provided with a ¾-inch test plug for testing. All tapping sleeves shall be hydrostatically tested up to 200-psi before a tap is made. Tapping sleeves shall NOT be air tested.

All mechanical joint tapping sleeves shall be manufacturer fabricated and approved for installation on the specific main line pipe material, whether ductile iron or asbestos cement. Tapping saddles may be utilized for tapping main lines 16-inches and larger in diameter if the branch line is 50% or less in diameter than the main line diameter.

2. Stainless Steel Tapping Sleeves, 6-inch through 12-inch main lines: Stainless steel tapping sleeves may be used in lieu of mechanical joint tapping sleeves for ductile iron or asbestos cement water mains through 12-inches in diameter at sizing as shown in the following table. All stainless steel tapping sleeves shall be manufactured in conformance with AWWA C223. All SS tapping sleeves shall be provided in a two piece assembly with a full circumferential gasket with tabbed gasket holding assembly and ¾-inch test plug. The back band shall be a minimum 14 gauge stainless steel and the front band (where the outlet is located) shall be a minimum 12 gauge stainless steel. The bolt bars shall be a minimum 7 gauge stainless steel. All SS tapping sleeves shall be manufacturer rated for a working pressure of 200-psi or greater and hydrostatically tested to 200-psi before a tap is made. Stainless steel tapping sleeves shall NOT be air tested.

Stainless Steel Tapping Sleeve Sizes

Nominal Main Size (inches)	Nominal Branch Size (inches)
6	4
8	4
8	6
10	4
10	6
12	4
12	6
12	8

3. Stainless Steel Tapping Sleeves, 14-inch through 24-inch main lines: For larger diameter water mains, stainless steel tapping sleeves approved by the Town may be used in lieu of a mechanical joint tapping sleeve for cases where the branch line is 50% or less in diameter than the main line diameter.

All of the previous specifications described for tapping sleeves from 6 to 12 inches shall be met for stainless steel tapping sleeves for larger diameter water mains. Additionally, the outlet band for SS tapping sleeves 16-inches through 24-inches shall be a minimum 7 gauge stainless steel. The back half of the sleeve shall be a minimum 12 gauge stainless steel.

4. Tapping Saddles, 16-inch through 24-inch main lines:

Tapping Saddles may be used in lieu of mechanical joint tapping sleeves to tap mains 16 inches and larger when the branch line is 50% or less in diameter than the main line diameter. Saddles shall be made of ductile iron providing a factor of safety of 2.5 with a working pressure of 250-psi. Saddles shall be equipped with an AWWA C110 flange connection on the branch. Sealing gaskets shall be O-ring type, high quality molded rubber having an approximate 70 durometer hardness, placed into a groove on the curved surface of the saddles. Straps shall be alloy steel. The minimum strap count for branch sizing from 4-12 inches is shown below.

Strap Requirements for Tapping Saddles

Nominal Saddle Outlet (inches)	Number of Straps
4	3
6	3
8	4
12	7

5. Service Line Taps: The maximum size of direct taps for DI water mains 6-inches or larger without a fitting, tapping sleeve or saddle shall be 1-inch. Any taps larger than 1-inch shall be provided with a saddle tap.

6. Corporation Stops:

a) Corporation Stops shall be ball type, made of “no lead” brass (meeting UNS C89833 as per ASTM B584) and complete with a compression 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 must be a minimum of 24 inches apart if they are on the same side of the pipe. All corporation stops shall be rated for a working pressure of 300-psi.

b) No burned taps will be allowed and each corporation stop will 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.

7. Service Saddles:

Service Saddles shall be used on all ductile iron water mains for taps larger than 1-inch or otherwise when direct taps cannot be made. Service saddles shall be used for all taps on existing water mains other than ductile iron, such as asbestos cement, PVC, etc. Service Saddles shall be provided with brass body and fasteners (85-5-5-5 waterworks brass or "no lead" brass meeting UNS C89833 as per ASTM B584) conforming to AWWA C800 and double straps made of silicon bronze conforming to ASTM A98 and factory installed grade 60 rubber gaskets. Service saddles shall be provided with AWWA standard threads per AWWA C800.

8. Copper Service Tubing: 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 (3) piece compression coupling. Only one (1) compression coupling shall be used for each 100 feet or fraction thereof.

9. Meter boxes for 1 inch services: 1-inch meter boxes shall be class 25 cast iron per ASTM A48. Meter boxes for 1-inch water services shall provide a cover opening of 8 X 18 1/8 inches and boxes shall measure at least 12.5 inches in depth. Lids shall also be cast iron and have the words "Water Meter" cast into them. They shall also be lockable. Lids shall be provided with a 2 inch (maximum) diameter hole to accommodate a transmitter. All lids shall be provided with a cast iron plug in the transmitter hole. All meter boxes and lids shall be installed as shown in the Details and have a black E-coating.

Meter boxes shall have 45 degree compression connections outside the box on both the inlet and outlet sides. There shall be a lockable ball valve inside the box on both the inlet and outlet which shall be permanently affixed to ensure proper spacing and alignment for the meter. Meter boxes shall also be provided with an ASSE 1024 approved inline, dual check valve located behind the meter. For boxes not utilizing a 1 inch meter, adapters shall be provided to accommodate a 5/8 x 3/4 inch meter. All fittings and connections shall be "no lead" brass conforming to UNS C89833 as per ASTM B584.

A "no lead" brass curb stop with compression connections shall be installed within 2 feet of the inlet connection. The curb stop may be buried without a box above it.

One 2 inch or 6 inch grade adjuster may be used when needed to meet final grade, however, no grade adjusters are permitted on new construction projects. Grade adjusters shall be cast iron or plastic when approved by the

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Director of Engineering. Grade adjuster and box shall be by the same manufacturer.

In isolated cases and when approved by the Director of Engineering, meter boxes may be located in driveways, alleys and/or parking areas. In these cases, a street rated box capable of withstanding a 40,000 lbs proof load shall be specified.

10. 1 ½ and 2 inch Water Services: 1 1/2” and 2” meter boxes shall be light weight polymer concrete as indicated in the Standard Details. Meter boxes for 1 ½ and 2 inch water services shall provide a cover opening of 24 X 36 inches and boxes shall measure at least 30-inches in depth and provided in straight wall arrangement. Standard meter box covers shall bolt down to the box, and all polymer cement covers shall be provided in solid configuration with a 2 inch diameter transmitter hole, and with the words, “Water Meter” cast into the lid. The meter box covers shall be provided with 2 stainless steel bolts in penta head configuration for security. Custom setter piping and fittings for 1 ½ and 2 inch water meters shall be constructed from “no lead” brass (meeting UNS C89833 as per ASTM B584) 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 should be tied into the existing storm drain system, or shall have an open bottom to all drainage through a 12-inch stone base. All meter box covers for potable water service shall be provided in standard concrete gray or black color.
11. Water services greater than 2-inches: A strainer shall be provided upstream of the meter on service lines greater than 2-inches.
12. Meter Vaults: Meter vaults and access doors within street right of way shall meet HS-20 loading requirements and shall be located outside of travel areas. Pedestrian rated covers of 300-psf will no longer be accepted regardless of where they are located. 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. If positive drainage is unobtainable, a sump pump shall be located and operated in the vault.

06050 IRRIGATION SYSTEMS

- A. 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 zone backflow preventers shall be installed above ground in an insulated box as shown by the details.

- B. 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 Inspection & Permits Department. If there is an approved site plan, it shall be referenced with the encroachment submittal to the Town.
- C. Pipe material for the mainline proposed to be used within the public right of way shall be Schedule 40 PVC or greater. A distance of at least 2 feet shall be provided from the back of curb. A minimum depth of 2 feet of cover shall be provided.
- D. The irrigation mainline pipe system shall be hydrostatically tested per Section 06060 with a minimum pressure of 200-psi or 50-psi above working pressure.
- E. All street crossings of irrigation systems shall be encased in ductile iron or steel conduit. Irrigation systems installed in the medians of Town maintained roadways must also have french drains installed behind the curb and gutter which are piped to a storm system.

06060 TESTING AND INSPECTIONS

A. GENERAL

- 1. All materials must be approved by the inspector prior to installation. Materials rejected by the Inspector shall be immediately removed from the job site.
- 2. The Contractor shall furnish all materials, labor, and equipment to perform all testing and inspections to the satisfaction of the Inspector. The Town shall provide water for testing purposes on water mains in accordance with Town Standard Procedure 4, Control and Monitoring of Water System Flow Activity.

B. TESTING

- 1. Hydrostatic Testing
 - a) No valve in the Town water system shall be operated without authorization in accordance with the Town Standard Procedure 4, "Control and Monitoring of Water System Flow Activity." 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. 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.

- b) When filling the pipeline, it is very important to fill the line slowly to avoid undue impacts associated with surge and to allow air to evacuate the pipeline. After all air has been expelled from the water main, the line shall be tested to a pressure of 200 psi as measured at the lowest elevation of the line for a duration of 2 hours. The testing period shall not commence until all air has been evacuated and the pressure has stabilized. 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.
- c) 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.

Maximum Leakage Allowed with Hydrostatic Testing

Pipe Size (Inches)	Allowable Leakage at 200-psi (Gal./Hr. per 1000 feet of pipe)
4	0.38
6	0.57
8	0.76
10	0.96
12	1.15
16	1.53
20	1.91
24	2.29
30	2.87
36	3.44
42	4.01

2. Disinfection

- a) All additions or replacements to the water system shall be disinfected with chlorine in conformance with AWWA C651 before being placed in service under the supervision of the Town's Inspector in the following manner:
- i. Taps shall be made at the control valve at the upstream end of the line and at all extremities of the line including valves.
 - ii. 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 not less than 50-ppm and not more than 100-ppm total chlorine immediately after chlorination. The chart below shows the required quantity of 70% HTH compound to be contained in solution in each 1000 feet section of line to produce the desired concentration from 50-ppm to 100 ppm.

Required Hypochlorite Concentration

Pipe Size (inches)	Pounds of High Test Hypochlorite (70%) to reach 50-ppm <i>per 1,000 feet of line</i>	Pounds High Test Hypochlorite (70%) to reach 100-ppm <i>per 1000 feet of line</i>
6	0.88	1.76
8	1.56	3.12
10	2.42	4.84
12	3.50	7.00
14	4.76	9.52
16	6.22	12.44
20	9.76	19.52
24	14.00	28.00

- iii. 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 must be pumped in at a constant rate for each discharge rate so a uniform concentration will be produced in mains.
- iv. HTH solution shall remain in lines for no less than 24 hours or as directed by the Town's Inspector.
- v. Extreme care shall be exercised at all times to prevent the HTH solution from entering existing mains.
- vi. Free residual chlorine after 24 hours shall be at least 10 ppm or the Inspector will require that the lines be re-chlorinated.

3. Flushing

- i. Flushing of lines may only proceed after 24 hours of disinfection contact time and as directed by Town staff, provided the free residual chlorine analysis is satisfactory.

- ii. At the completion of disinfection, chlorinated water flushed from the water main shall be disposed of in conformance with all Federal, State and local regulations.
- iii. In accordance with all applicable regulations, a neutralizing chemical shall be applied to minimize chlorine residual in the flushing water before discharging from the water main, unless an alternate plan is submitted in writing and approved by the Town.
- iv. Water used for disinfection shall be flushed from the water main until the chlorine residual concentration is below 5-ppm before initiating sampling.

4. Bacteriological and Turbidity Sampling

- a) Bacteriological sampling shall be utilized to verify disinfection prior to placing a newly constructed water main in operational service. Bacteriological sampling shall consist of 2 consecutive sets of acceptable samples taken at least 24-hours apart and collected from each 1,200-ft section of water main and all dead ends and branches as outlined by ANSI/AWWA C651.
- b) For the first round of sampling, the requested laboratory analysis shall be specified as follows: "Bacteriological Test and Turbidity." For the second round of testing, the laboratory analysis shall be specified as, "Bacteriological Test Only."
- c) Samples for laboratory analysis shall be collected by the Town's Inspector 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 make arrangements with the laboratory that all test results be submitted directly to the Town's inspector or other designee approved by the Engineering Inspector. All costs for laboratory testing shall be borne by the Contractor.
- d) The laboratory secured for testing shall be certified by the State Laboratory of Public Health. All sample bottles for bacteriological sampling provided by the laboratory shall be sterilized and treated with a dechlorinating agent, such as sodium thiosulfate. Samples for turbidity shall be taken in plain sterilized bottles from the lab, which are separate from the bottles provided for bacteriological testing. The sample bottles shall be provided with tamper proof seals that will be adhered to the bottles by the Town's inspector. The inspector shall provide a sample identification number, job title and an identification of Phase 1 or Phase 2 sampling that will be provided on the tamper proof custody seal. The bottles and tamper proof

custody seals shall be accompanied by a chain of custody form provided by the certified laboratory conducting the testing. All sample identification numbers, job titles, and Phase 1 or Phase 2 testing identification from the custody seal shall be recorded on the chain of custody forms by the Engineering Inspector.

- e) All samples shall be collected in compliance with the sampling protocols provided by the certified laboratory, and processed for delivery under the direct supervision of the Engineering Inspector. The samples shall be collected by the Town's inspector or designee and kept in a cooler provided by the Contractor at approximately 40-degrees Fahrenheit or 4-degrees Celsius and delivered to the certified lab for testing as soon as possible. The time at which the sample is taken shall be recorded on the chain of custody form by the Engineering Inspector. Any samples processed at the laboratory more than 30-hours following collection shall be declared invalid, i.e. samples shall be submitted to the lab within 24-hours of collecting them.
- f) All first round samples shall be tested for bacteriological quality and turbidity in accordance with standards established by NCDENR and AWWA. If turbidity exceeds 0.8 NTU, the sample shall fail and the system shall be reflashed before initiating a new round of testing.
- g) If the phase 1 sample results for bacteriological quality and turbidity are acceptable, then a second set of samples can be collected at least 24-hours following the first sample collection. No additional flushing other than required to obtain a representative sample will be allowed prior to collecting the second set of samples.
- h) The second set of samples shall be tested for bacteriological quality only. All custody seals and chain of custody forms shall identify the second round samples as "Phase 2" testing to notify the lab that the first set of samples have already been evaluated and received a satisfactory laboratory analysis.
- i) At the completion of sampling, the total chlorine concentration shall be at least 2-mg/L and no higher than 4-mg/L before the system can be made operational.
- j) If test results are unsatisfactory, the Contractor shall immediately rechlorinate lines and proceed with such measures as are necessary to properly disinfect the lines.
- k) The new water system shall be valved off from the existing system until a satisfactory bacteriological laboratory analysis has been obtained and the Inspector has authorized the use of the new water system.

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06070 REPAIR AND REHABILITATION

- A. Joint leaks of Ductile Iron Pipe shall be repaired by using a bell joint leak repair clamp approved by the Town or otherwise replacing the damaged pipe and reconnecting with a mechanical joint sleeve connection.
- B. Line Breaks or Punctures shall be repaired by a full circle repair clamp as approved by the Town or otherwise replacing the damaged pipe and reconnecting with a mechanical joint sleeve connection.
- C. Line Splits or Blow Outs shall be repaired by replacing the damaged section with ductile iron pipe with a restrained sleeve connection at each end.
- D. For A.C. Pipe to PVC or Ductile Iron Pipe transitions use a Hymax style coupling with different end diameters sized specifically for the pipe materials and pipe outside diameter at each end.
- E. All water main point repairs shall be replaced with DIP in accordance with these specifications and backfilled with crush and run stone compacted to 95% maximum dry density as specified elsewhere in the Standard Specifications.
- F. Water Service Line Repairs
 - 1. 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 “no lead” brass 3 piece compression unions.
 - 2. A corporation stop pulled out of a PVC pipe water main shall have a new service saddle and a new “no lead” brass corporation stop installed on the water main.
 - 3. 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 and a new “no lead” brass corporation stop installed on the water main.

END OF SECTION 06000

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