

**DESIGN STANDARDS  
FOR  
WATER DISTRIBUTION SYSTEMS**

**1.0 GENERAL:** The following water supply planning standards are based on Federal, State and local health requirements and engineering design criteria. In general, the "Ten States Standards" shall apply where applicable.

1.0.1 Applicability: These criteria shall apply to all developments including but not limited to residential, commercial, institutional and industrial developments, subdivisions, parks and/or recreational areas desiring water service from the Lexington County Joint Municipal Water and Sewer Commission (the Commission).

1.0.2 Quality: All installations, whether public or privately-owned, are to deliver water to the consumer which meets the bacteriological and chemical standards of the South Carolina Department of Health and Environmental Control (DHEC).

1.0.3 Quantity: All improvements shall be designed to provide fire protection in accordance with current DHEC guidelines. All water distribution systems shall be designed using a Hazen-Williams coefficient, C, of 100 for Ductile Iron (DI) water mains and 135 for PVC water mains.

**2.0 WATER MAIN DESIGN:**

2.0.1 Grid: Distribution mains shall be a minimum of six inches in diameter and interconnected where possible.

2.0.2 Pressure: All water mains shall be sized after a hydraulic analysis based on flow demands and pressure requirements. The system shall be designed to maintain a minimum pressure of not less than 20 psi at ground level at all points in the distribution system under fire flow conditions, and a minimum pressure of not less than 25 psi under conditions of maximum instantaneous demand. The normal working pressure in the distribution system shall not be less than 35 psi. Pressures which may exceed 90 psi shall be controlled through the use of pressure reduction devices.

2.0.3 Diameter: The minimum size of water main for providing fire protection and serving fire hydrants shall be six-inch (6") diameter. Larger size mains will be required if necessary to allow the withdrawal of the required fire flow while maintaining the minimum residual pressure specified above.

2.0.4 Small Mains: Water main piping may be less than six-inch diameter, when properly sized, for court and cul-de-sac streets that do not require a fire hydrant or extensions to adjacent properties. In no case, however, will water main piping be less than four (4) inch diameter.

2.0.5 Hydrants: Fire hydrants shall not be installed on water mains less than six inches in diameter.

2.0.6 Dead Ends: Dead ends mains shall be minimized by looping of all lines whenever practical, as determined by the Commission. The length of dead end lines shall not exceed 1500 ft. for 4" water mains.

2.0.7 Flushing: Dead-end mains shall be provided with a fire hydrant if flow and pressure are sufficient, or with an approved flushing post hydrant for flushing purposes. Flushing devices should be sized to provide flows which will give a velocity of at least 2.5 feet per second in the line being flushed (3.0 feet per second for PVC mains). No flushing device shall be connected to any sewer.

### **3.0 VALVES:**

3.0.1 Gate valves shall be provided where water mains intersect. A minimum of two valves shall be installed at each tee intersection; a minimum of three valves is required for a cross intersection. Valves shall be located at not more than 500 foot intervals in commercial districts and not more than 1000 foot intervals in other urban districts. Longer intervals shall be reviewed by the Commission on a case-by-case basis. Butterfly valves are not allowed on the system.

3.0.2 Pressure Reducing Valves (PRV's): PRV stations shall be required where system static pressures exceed 100 psi or as deemed needed by the Commission. Two PRV's shall be provided per station. One PRV shall be full line size and a by-pass PRV shall be provided based on design requirements of inlet pressures, outlet pressures and minimum rate of flow.

3.0.3 Altitude Valves: Valves shall be sized based on flow rates, line size, inlet pressures and tank elevation. Single acting (one way flow) with separate check valve discharge line shall be the standard design configuration for altitude valves. Altitude valve design shall also consider special requirements such as throttling, delayed opening or solenoid override. All altitude valve design shall be closely coordinated and approved in writing by the Commission.

### **4.0 HYDRANTS:**

4.0.1 Location and Spacing: Hydrants shall be provided at each street intersection and at intermediate points between intersections as follows:

- a. In areas of single family homes, no residence shall be greater than 500 feet from a fire hydrant.
- b. In all other districts, no structure shall be greater than 250 feet from a fire hydrant. In all cases, spacing shall comply with National Fire Prevention Code (NFPC).

4.0.2 Hydrant Leads- The hydrant lead shall be a minimum of six inches in diameter. Auxiliary valves shall be installed in all hydrant leads. Hydrant leads shall be DI pipe.

4.0.3 Drainage- Hydrant drains shall not be connected to or located within 10 feet of sanitary sewers or storm drains.

### **5.0 AIR RELIEF VALVES; VALVE, METER AND BLOW-OFF CHAMBERS:**

5.0.1 Air Relief Valves: Provisions shall be made at high points in water mains where air can accumulate to remove the air by means of air relief valves. Automatic air relief valves shall not be used in situations where flooding of the manhole or chamber may occur.

5.0.2 Chamber Drainage: Chambers, vaults, pits or manholes containing valves, blow-offs, meters or other such appurtenances to a distribution system shall not be connected directly to any storm drain or sanitary sewer, nor shall blow-offs or air relief valves be connected directly to any sewer. Such chambers or pits shall be drained to the surface of the ground where they are not subject to flooding by surface water, or to absorption pits underground.

**6.0 INSTALLATION OF MAINS:**

6.0.1 Bedding: A continuous and uniform bedding shall be provided in the trench for all buried pipe. Backfill material shall be tamped to 90% Std. Proctor (AASHTO T99) in layers around the pipe and to a sufficient height above the pipe to adequately support and protect the pipe. Stones found in the trench shall be removed for a depth of at least six inches around the pipe.

6.0.2 Cover: All water mains shall be covered with sufficient earth or other insulation to prevent freezing. Minimum cover depth shall be as follows:

<u>Pipe Diameter</u>	<u>Minimum Cover</u>
8", or smaller	36"
10" and 12"	48"
14", or larger	48"

All pipe in SCDOT R/W shall have a 48" minimum cover below elevation of center of road.

6.0.3 Blocking: All tees, bends, plugs, hydrants and other appropriate appurtenances shall be provided with reaction blocking and tie rods or joints designed to prevent movement.

6.0.4 Pressure and Leakage Testing: All types of installed pipe shall be pressure tested and leakage tested in accordance with the latest edition of AWWA Standard C600.

6.0.5 Disinfection: All new, cleaned or repaired water mains shall be disinfected in accordance with the latest edition of AWWA Standard C651.

**7.0 SEPARATION OF WATER MAINS, SANITARY SEWERS AND STORM SEWERS:**

7.0.1 General: At a minimum, the following factors should be considered in providing adequate separation:

- a. Materials and type of joints for water and sewer pipes,
- b. Soil conditions,
- c. Service and branch connections into the water main and sewer line,
- d. Compensating variations in the horizontal and vertical separations,
- e. Space for repair and alterations of water and sewer pipes,
- f. Off-setting of pipes around manholes.

- 7.0.2 Parallel Installation: Water mains shall be laid at least 10 feet horizontally from any existing or proposed sewer. The distance shall be measured edge to edge. In cases where it is not practical to maintain a ten foot separation, the water main may be installed closer to a sewer provided that the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer. Where this vertical separation cannot be obtained, the sewer shall be constructed of materials and with joints that are equivalent to water main standards of construction and shall be pressure tested to ensure watertightness prior to backfilling.
- 7.0.3 Crossings: Water mains crossing sewers shall be laid to provide a minimum vertical distance of 18 inches between the outside of the water main and the outside of the sewer. This shall be the case where the water main is either above or below the sewer. At crossings, one full length of water pipe shall be located so both joints will be as far from the sewer as possible. Special structural support for the water and sewer pipes may be required.
- 7.0.4 Force Mains: There shall be at least a 10 foot horizontal separation between water mains and sanitary sewer force mains. There shall be an 18 inch vertical separation at crossings as required above.
- 7.0.5 Sewer Manholes: No water pipe shall pass through or come in contact with any part of a sewer manhole.

**8.0 SURFACE WATER CROSSINGS:** Surface water crossings, whether over or under water, present special problems. The Commission should be consulted before final plans are prepared.

- 8.0.1 Above-water Crossings: The pipe shall be adequately supported and anchored, protected from damage and freezing, and accessible for repair or replacement.
- 8.0.2 Underwater Crossings: A minimum cover of two feet shall be provided over the Ductile Iron pipe. When crossing water courses which are greater than 15 feet in width, the following shall be provided:
  - a. The pipe shall be of special construction, having flexible watertight joints,
  - b. Valves shall be provided at both ends of water crossings so that the section can be isolated for testing or repair; the valves shall be easily accessible, and not subject to flooding,
  - c. Sampling taps shall be provided at each end of the crossing, and
  - d. A blow-off shall be provided at the opposite end from the supply source.

**9.0 CROSS-CONNECTIONS AND INTERCONNECTIONS:**

- 9.0.1 Cross-connections: There shall be no connection between the distribution system and any pipes, pumps, hydrants, or tanks whereby unsafe water or other contaminating materials may be discharged or drawn into the system.
- 9.0.2 Cooling Water: Neither steam condensate nor cooling water from engine jackets or other heat exchange devices shall be returned to the potable water supply.

9.0.3 Interconnections: The written approval of the Commission shall be obtained for interconnections between potable water supplies.

**10.0 WATER SERVICES AND PLUMBING:**

10.0.1 Plumbing- Water services and plumbing shall conform to relevant plumbing codes.

10.0.2 Booster Pumps: Individual booster pumps shall not be allowed without prior written approval of the Commission for any individual service from the public water supply mains.

**11.0 SERVICE METERS:** Each service connection shall be individually metered.