

Section V
WATER DISTRIBUTION SYSTEM
DESIGN GUIDELINES

A. GENERAL

1. The following water system design guidelines are based on Federal, State and local health requirements and the Hilton Head No. 1 Public Service District's engineering design criteria.
2. Design criteria not indicated herein shall comply with "Ten States Standards" where applicable.
3. All installations are to meet the bacteriological and chemical quality standards of the South Carolina Department of Health and Environmental Control (SCDHEC).
4. These design guidelines are applicable to all developments including but not limited to residential, commercial and industrial developments, subdivisions, commercial and industrial developments, subdivisions and/or parks requiring water service from the Hilton Head No.1 Public Service District.
5. All design criteria, materials, and construction shall be in accordance with DHEC regulations, AWWA and ASTM standards.

B. SYSTEM DESIGN CRITERIA

1. Design data and design calculations shall include the following:
 - a. System pressures at maximum instantaneous demand (not less than twenty-five (25) pounds per square inch); or fire flow in addition to peak hourly flow or flushing flow in addition to peak hourly flow (not less than twenty (20) pounds per square inch), whichever is the worst case.
 - b. Number and type of proposed connections.

- c. Fire flow requirements – Shall equal five hundred (500) + one - fifths (1/5) of the maximum instantaneous flows.
- d. Fire flow test results, conducted in the past twelve (12) months, at a location near the proposed connection to the existing system. The results shall include the static and residual pressures when a known flow, time and date of test, existing pipe size, type of pipe, and the elevation and distance between test point and connection. Known flow must be in excess of the demand for the extension.
- e. Design head loss calculations, including elevation changes shall show twenty-five (25) pounds per square inch minimum residual when instantaneous demand occurs or twenty (20) pounds per square inch minimum residual when either fire flow or flushing flow in excess of peak hourly flow occurs, whichever is greater.

2. Line Sizing –

- a. Pressure – the minimum pressure in all public water mains under conditions of maximum instantaneous demand shall be twenty-five (25) pounds per square inch at every customer's tap. Twenty (20) pounds per square inch will be acceptable at any tap when fire flows or flushing flows are provided in excess of minimum peak hourly flow.
- b. No line extension shall be made of an existing line when the existing line does not meet the minimum pressure and flow requirements of this regulation.
- c. Diameter – The minimum size of water mains for providing fire protection and serving fire hydrants shall be six (6) inches in 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 in R.61-58.4(D)(4)(a).
- d. Line extensions of an existing line must not be made when the existing line does not meet the minimum pressure and flow requirements specified in section R.61-58.4.D(4)(a).

3. Dead ends –
 - a. Dead ends shall be minimized by looping of all water mains, whenever practical.
 - b. Avoid dead-end lines, if possible. Check lines less than two hundred (200) feet to ensure that they have sufficient flow to avoid stagnant water in the lines in addition to maintaining a chlorine residual. Should have plans to extend these types of lines within a year.
 - c. The lengths of small dead-end lines shall not exceed the following:
 - i. One (1) inch diameter - 150 feet.
 - ii. One and one quarter (1 ¼) inch diameter - 200 feet.
 - iii. One and one half (1 ½) inch diameter - 300 feet.
 - iv. Two (2) inches diameter - 1,500 feet.
 - d. Conditions may warrant having less than the above maximum lengths in order to meet the twenty-five (25) pounds per square inch pressure requirement.
4. Flushing – The design shall provide for a readily accessible means of flushing all water lines at a minimum velocity of 2.5 feet per second. This does not apply to service lines.
5. Blow-offs required where changing pipe size, unless engineer can demonstrate that there is adequate pressure to flush the lines. Plans should specify size of blow-off. Dead end lines shall be provided with a fire hydrant if flow and pressure are sufficient, or with a post hydrant or blow-off valve in a box for flushing purposes, except for lines:
 - a. 1.5 inches in diameter and less will not require blow-offs but will require a service connection.
 - b. 200 feet or less in length will not require blow-offs, unless specifically required by the Department.

6. Blow-offs sized to provide a minimum velocity of 2.5 fps in the line & maintain a residual pressure of 25 psi.
7. Where Post-type hydrants are proposed, they must meet the flow requirements for blow-offs in R.61-58.4.D(7). Post hydrants shall not be used on lines smaller than three (3) inches. Design calculations must be submitted when utilizing post hydrants on three (3) inch lines. These calculations must show one hundred (100) gallons per minute in excess of peak hourly flow can be maintained and provide a residual pressure greater than or equal to twenty (20) pounds per square inch.
8. Post-type hydrants are acceptable for flushing purposes on lines four (4) inch through eight (8) inch and can be used on three (3) inch lines where the design flow is increased to one hundred (100) gallons per minute in excess of peak hourly flow.
9. Lines ten (10) inches and larger require flows in excess of five hundred (500) gallons per minute to achieve a two and a half (2.5) feet per second scouring velocity. This requires a standard fire hydrant or other approved blow-off, for flushing which must be designed to provide at least five hundred (500) gallons per minute in excess of peak hourly flow and a minimum residual pressure of twenty (20) pounds per square inch.
10. No flushing device shall be directly connected to any sewer.
11. Valves – Sufficient valves shall be provided on water mains so that customer inconvenience and sanitary hazards will be minimized during repairs.
 - a. Valves are required at all intersections and on loops.
12. Hydrants –
 - a. Where standard four (4) to six (6) inch diameter hydrants are proposed, the design flow shall not be less than five hundred (500) gallons per minute over and above peak hourly flow. Standard hydrants shall not be placed on systems using only hydropneumatic storage, unless standby power is provided and the pumping capacity from wells or ground storage exceeds the fire flow demand with the largest well or pump out of service. Standard hydrants shall not be connected to lines not designed to carry fire flows.

- b. Where post-type hydrants are proposed, they must meet the flow requirements for blow-offs in R.61-58.4.D(7). Post hydrants shall not be used on lines smaller than three (3) inches. Design calculations must be submitted when utilizing post hydrants on three (3) inch lines. These calculations must show one hundred (100) gallons per minute in excess of peak hourly flow can be maintained and provide a residual pressure greater than or equal to twenty (20) pounds per square inch.
13. Use DIP with mechanical joints for any lines being installed in rock.
14. Water services and plumbing must conform to relevant local plumbing codes or the National Plumbing Code.
15. Individual home booster pumps are not allowed to meet the twenty-five (25) pounds per square inch minimum pressure at the service connection.
16. Water Loading Stations - To prevent contamination of the public water supply, the following criteria must be met:
- a. Air Gap - A device must be installed on the fill line to provide an air break and prevent a submerged discharge line.
 - b. Hose Length - The fill hose and cross connection control device must be constructed so that when hanging freely it will terminate at least 2 feet above the ground surface.
 - c. Fill line terminus - The discharge end of the fill line must be unthreaded and constructed to prevent the attachment of additional hose, piping or other appurtenances.
17. Distribution main size: minimum 6" diameter.
18. Arrange mains so they are looped and interconnected at intersections.
19. Comply with all application requirements of the SCDHEC, the Town of Hilton Head and Hilton Head Fire Marshall.
20. Hazen and Williams design coefficient:
- a. PVC: C=140
 - b. Ductile iron pipe: C=120

21. Air relief valves shall not be allowed. Hydrants shall be placed at high points in water systems as required to expel air when necessary.
22. Chamber drainage - Chambers, pits or manholes containing valves, blow-offs, meters, air release valves or other such appurtenances to a distribution system, shall not be connected directly to any storm drain or sanitary sewer.

C. HILTON HEAD PUBLIC SERVICE DISTRICT NO. 1 MASTER PLAN

1. Design system to comply and be compatible with the District's Water System Master Plan.

D. FIRE HYDRANTS

1. Comply with the Town of Hilton Head Fire Code.
2. Fire hydrant spacing:
 - a. Low density residential, less than five (5) units per acre: one thousand (1,000) feet or at each intersection.
 - b. High density residential, single-family homes, more than five (5) units per acre: six hundred (600) feet.
 - c. High density residential, apartments, condominiums, etc.: five hundred (500) feet.
 - d. Commercial and isolated industrial: five hundred (500) feet.
3. Fire hydrant leads to be a minimum of six (6) inches diameter with an isolation valve.

E. SIZING OF LINES

1. Pipe size six (6) inches and larger:
 - a. Size piping based on either 1/5 the instantaneous maximum flow plus fire flow or maximum instantaneous demand, whichever is greater.

2. Pipe size four (4) inches and smaller:
 - a. Size piping based on either 1/5 of maximum instantaneous demand plus blow off flow to meet flushing requirements or maximum instantaneous demand whichever is greater.
3. The maximum instantaneous demand is to be calculated using the **Community Water System Source Book** by Joseph S. Amen, as a reference.
4. Design for flushing velocity per SCDHEC regulations.
5. Minimum design residual pressure: twenty (20) pounds per square inch.
6. The Developer's Design Engineer is to determine available static and residual pressures at the delivery point for the water to a new development. The data is to be obtained under the direction of an engineer who is registered in the State of South Carolina.

F. VALVES AS INDICATED BELOW

1. Provide three (3) valves for a tee intersection.
2. Provide four (4) valves for a cross intersection.
3. Maximum valve spacing: one thousand (1000) feet.

G. INDUSTRIAL OR SPECIAL DESIGN CONDITIONS

1. Design of water systems for industrial or other systems not covered under this section shall be approved on a special case basis only. Special requests need to be made to the Hilton Head No. 1 Public Service District.

H. DEAD ENDS

1. Minimize dead ends by looping of all mains.
2. Where dead ends occur provide a fire hydrant on lines six (6) inches.
3. Do not connect any flushing device to any sanitary sewer.

I. SEPARATION OF WATER MAINS AND SEWERS

1. Where possible, locate water line at least ten (10) feet away, horizontally, from sewer pipes.
2. Should ten (10) foot separation not be practical, then the water main may be located closer provided:
 - a. It is laid in a separate trench.
 - b. It is laid in the same trench with the water main located at one side of a bench of undistributed earth.
 - c. In either of the above cases, crown elevation of the sewer shall be at least eighteen (18) inches below invert elevation of water line.
3. Where water lines cross over sewers, maintain eighteen (18) inches minimum clearance between crown of sewer and invert of water lines.

J. THRUST BLOCK DESIGN

1. Maximum soil pressure: two thousand (2000) pounds per square foot.
2. Minimum water pressure: one hundred fifty (150) pounds per square inch.

K. COVER

1. Provide suitable cover on all distribution mains. Minimal cover depth as follows:
 - a. Less than eight (8) inch diameter: thirty (30) inches.
 - b. Ten (10) inch and twelve (12) inch diameter: thirty-six (36) inches.
 - c. Fourteen (14) inch diameter and larger: forty-eight (48) inches.
 - d. All piping located within the right-of-way of the South Carolina Department of Transportation shall have a cover as indicated above or thirty-six (36) inches below the elevation of the road, whichever is greater.

- e. Special conditions other than those listed above may be approved if requested in writing from the Hilton Head No. 1 Public Service District.

L. DUCTILE IRON PIPE LOCATIONS

- 1. Use ductile iron pipe where water line:
 - a. Twelve (12) inches or larger.
 - b. Crosses beneath sewers.
 - c. Crosses beneath storm drainage pipe with less than three (3) feet of clearance.
 - d. Crosses above a storm drainage or other pipe with less than two (2) feet of clearance.
 - e. Crosses creeks, rivers and other water bodies.
 - f. Installed in casing.
 - g. Cover is less than minimum prescribed in Part K above.