

ARTICLE II

WATER DISTRIBUTION SYSTEM

201.00 GENERAL REQUIREMENTS

- 201.01 Conformance and Interpretation: Authority for discretionary provisions for water design shall rest with the Director of Public Works for the City of Manassas Park, who when necessary shall request and obtain the advice of the City Engineer. All materials, equipment and construction not currently covered in this PFM shall be in accordance with the applicable American Waterworks Association Standards or other recognized standards acceptable to the Director of Public Works.
- 201.02 Water Quality Requirements: All water furnished for domestic, commercial, or industrial consumption shall be of such quality as to meet all requirements of the Virginia Department of Health.
- 201.03 Easements: When deemed necessary by the Director of Public Works, and in order to assume maximum utilization of the water system, it will be required that appropriate easements shall be obtained for access to or extension of a public utility.

202.00 DESIGN STANDARDS

- 202.01 Capacity to Serve: The water distribution system and any extensions thereof shall have adequate capacity to supply the normal (average) and peak hour demands of all customers - domestic, public, commercial and industrial - while maintaining a pressure of not less than 30 pounds per square inch at all points of delivery. In addition, the system shall be capable of delivering on the day of maximum customer demand, flows required for fire protection to at least one point within 300 feet of each building to be served or proposed to be served by such system and extension, while maintaining a residual pressure of not less than 20 pounds per square inch at the point of service. Flows required for fire protection shall be determined in accordance with the "Standard Schedule for Grading Cities and Towns of the United States" of the American Insurance Association, New York, New York, but shall not be less than the following:

A. Industrial and Mercantile Districts	3,000 gpm
B. Apartments and Town Houses	2,000 gpm
C. Schools, Elementary	2,500 gpm
D. Schools, Secondary and High	3,000 gpm
E. Residential	1,750 gpm
F. Minimum (applicable to sparsely developed residential areas)	1,000 gpm

The Virginia Insurance Rating Bureau shall be consulted regarding fire protection flows required for high value regional mercantile districts, university campuses, etc.

202.02 Capacity Design Criteria: The following criteria will be used in estimating demands for water and accomplishing hydraulic design of the system.

A. Average day, maximum day and peak hour demands to be used in system hydraulic design will be estimated using the following parameters:

1. Residential Population
 - a. Single Family House
N = number of dwelling units x 4.0
 - b. Townhouse
N = number of dwelling units x 3.6
 - c. Apartment
N = number of dwelling units x 3.0
2. Average daily water demand of residential population in gallons per day (g.p.d.)
R = N x 100
3. Average daily commercial and industrial water demand in g.p.d.
C = no. of commercial and industrial employees x 100*
4. Average daily school water demand in g.p.d.
S = number of staff employees and students x 20
5. Average daily water demand in g.p.d.
A = R + C + S

- 6. Maximum daily water demand in g.p.d.
 $M = A \times 1.5$ for high pressure zone
- 7. Peak hour demand in g.p.d.
 $P = M \times 1.5$ for high pressure zone
- 8. Peak hour demand in gallons per minute (g.p.m.)
 $P = M \times 1.5/1440$

*Note: Appropriate additional water demand allowances shall be made for commercial and/or industrial establishments of types having water demands in excess of 100 g.p.d. per employee.

- B. When water distribution system extensions are to be made, the landowner shall first determine the quantity of water required and then obtain from the City the hydraulic gradient for the point of connection to the City's system while providing said demands. Distribution piping design will be based upon providing capacities and service pressures in accordance with these standards from the supply design gradient furnished by the City.
- C. Hydraulic design of distribution piping will be based on pipe carrying capacities consistent with head losses determined in accordance with the following:

<u>Pipe Diameter</u>	Hazel-Williams Coefficient <u>"C"</u>
6"	100
8"	110
10"	115
12" and greater	120

202.03 Distribution System Layout Criteria:

- A. Secondary loops and cross mains with diameters less than 12" shall be spaced not more than 1,000 feet apart with no dead-end length exceeding 500 feet for any 6 inch main. No mains shall be less than 6 inches inside diameter (I.D.).
- B. All mains, branches and dead-ends shall be equipped with blow-offs and/or hydrants of adequate size and number to develop a velocity in the main of at least 2.5 feet per second. Branches of 5 feet in

length or less from the tee or cross to valve, or blind flange or plug need not be equipped with a blow-off provided a tablet of chlorine releasing compound is installed and fixed in place in the branch during construction.

- C. Automatic combination air-vacuum release valves shall be installed at the high points of water mains 16-inches I.D. and larger, where accumulation of air may interfere with flow. Blow-offs will be required at low points of lines 16-inches I.D. and larger. Air vacuum release valves and blow-offs will be installed in all other main sizes as required. Water mains 16-inches I.D. and larger shall not be tapped for individual services. Individual services shall be supplied from distribution mains connected to secondary feeders.
- D. Valves shall be installed at the intersections of water lines. Generally, three (3) valves will be used at crosses and two (2) valves at tees. A valve shall also be installed every one thousand feet (1000') on distribution mains. Additional valves may be required at the discretion of the Director of Public Works.
- E. A valve shall be installed at the public right-of-way line or water easement line wherever a private extension connects with the public water system.
- F. Fire hydrants shall be located on the distribution system as follows:
 - 1. In water systems and extensions serving one - or two-family residential areas, fire hydrants shall be located and installed so that there will be at least one hydrant within 300 feet of the farthest point of a wall of any building (existing or proposed in ultimate development) serviced by said system or extension.
 - 2. Hydrants along streets or roads on which one - or two family residences front shall be spaced not more than 500 feet apart.
 - 3. In commercial, industrial, apartment, and town house areas, fire hydrants shall be provided as required to meet the fire protection standards of the American Insurance Association. In no case shall more than 300 feet of fire hose be required to reach any point at the base of any exterior building wall from the nearest fire hydrant or from each of the hydrants required to supply the stipulated fire flow.

4. Not more than one fire hydrant shall be located on any 6-inch I.D. dead-end main and said fire hydrant shall be located not more than 300 feet from a looped main.

- G. Backflow Preventer: A Watt #7 Dual Check Backflow Preventer or equal double check valve shall be installed at the meter as shown on plate IIA of this PFM.

- H. Water sample tap shall be provided as required by the Director of Public Works.

- I. Separation of water lines and sanitary sewers shall be as follows:
 1. General: The following factors shall be considered in providing adequate separation:
 - (a) Materials and types of joints for water and sewer pipes.
 - (b) Soil Conditions.
 - (c) Service branch connections into the water line and sewer lines.
 - (d) Compensating variations on the horizontal and vertical separations.
 - (e) Space for repairs and alterations of water and sewer pipes.
 - (f) Offsetting of pipes around manholes.
 - (g) Standards & recommendations by Virginia Department of Health.

 2. Parallel Installation:
 - (a) Normal Conditions - Water lines shall be laid horizontal to provide a separation of at least 10 feet from a sewer or sewer manhole, measured edge-to-edge, whenever possible.
 - (b) Unusual Conditions - When local conditions prevent a horizontal separation of 10 feet between water and sewer lines and facilities, the water line may be laid closer to a sewer provided that:
 - (1) The bottom of the water line is at least eighteen inches (18") above the top of the sewer or
 - (2) Where this vertical separation cannot be obtained, the sewer shall be constructed of mechanical joint water pipe and pressure-tested in place to 50 psi without leakage prior to backfilling.

3. Crossing Installation:
 - (a) Normal Conditions - Water lines crossing sewers shall be laid to provide a vertical separation of at least 18" between the bottom of the water line and the top of sewer line whenever possible.
 - (b) Unusual Conditions - When local conditions prevent a vertical separation described in 3(a) above, the following construction shall be used:
 - (1) Sewers passing over or under a water line shall be constructed of the materials described in 2(b)(2).
 - (2) Water lines passing under sewers shall, in addition, be protected by providing:
 - (aa) A vertical separation of at least 18" between the bottom of the sewer and the top of the water lines.
 - (bb) Adequate structural support for the sewers to prevent excessive deflection of the joints and settling on or breaking of the water line.
 - (cc) The length of the water line be centered at the point of the crossing so that joints shall be equidistant and as far as possible from the sewer.
4. Storm Sewers or Sewer Manholes: No water lines shall pass through or come in contact with any part of a sewer or sewer manhole.

J. Minimum Pipe Cover:

All mains smaller than 16-inches I.D. shall be laid with a minimum cover of 36 inches from top of pipe to finished ground surface grade, except that at obstructions which cannot be relocated or modified, the cover may be reduced as necessary for short lengths (10 to 20 feet) to pass over the obstruction using three (3) flexible joints in the offset within a length of approximately eight (8) feet, but in no case shall depth of cover be less than 24 inches.

Approved bedding material shall be used wherever cover is less than 36 inches and shall completely encase pipe. No tees, valves, or house service corporation cocks shall be installed in mains with less than 36 inches of cover. All mains 16-inch I.D. and larger shall be laid with a minimum cover of 42 inches from top of pipe to finished ground surface grade. Where for any size pipe the depth of cover would be less than 24 inches over top of pipe at an obstruction, the water main shall pass under the obstruction and clear the obstruction by at least one foot (1') and shall be completely encased in concrete

up to the bottom of the obstruction with not less than 6 inches of concrete at the bottom and sides of the pipe.

- K. Surface Water Crossings: Surface water crossings, both over and under water, present special problems and should be discussed with the City before final site and construction plans are prepared and, in addition to project specific requirements for such crossings, shall meet the following criteria: .
1. Above Water Crossing: A pipe crossing above water shall be:
 - (a) adequately supported,
 - (b) adequately protected from damage from freezing,
 - (c) readily accessible for repair or replacement, and
 - (d) located above 100-year flood level.
 2. Underwater Crossing:
 - (a) The pipes shall be of special construction, having flexible watertight joints.
 - (b) Valves shall be provided at both ends of the water crossing so that the section can be isolated for tests or repairs; the valves shall be easily accessible and not subject to flooding.
 - (c) Sample taps shall be available at each end of the crossing and at a reasonable distance from each side of the crossing.
 - (d) Permanent taps shall be made for testing and locating leaks.

203.00 MATERIALS AND EQUIPMENT

All pipe for water main construction shall be ductile iron pressure pipe of the "push-on" joint or "mechanical joint" variety, conforming to ANSI A21-51 (AWWA C151, latest revision). Thickness class shall be class 52 for all pipe twelve inches (12") or less in diameter and class 51 for all pipe greater than twelve inches (12") in diameter.

- 203.01 Ductile Iron Standard Mechanical Joint Pipe: All ductile iron standard mechanical joint water pipe shall conform to ANSI Specification A21.51 and shall be double lined with cement mortar and have a protective exterior coating. Linings and protective coatings equal to "Enameline" with tar coating on the exterior will be considered as a satisfactory lining and coating for the water pipe; however, any substitution in pipe lining and/or coating from the