CHAPTER 4 - DESIGN STANDARDS FOR WATER DISTRIBUTION FACILITIES

4.1 GENERAL REQUIREMENTS

4.1.01 Water and fire protection distribution facilities are to be provided solely for the purpose of supplying potable water and fire protection. Under no circumstances shall cross-connections be allowed to unapproved water facilities. The following design parameters should be used in the design of water distribution facilities. Water transmission facility design parameters are not included herein and such criteria will be established on a case by case basis.

4.2 TECHNICAL DESIGN

4.2.01 System Layout

A. The overall layout and general design shall conform to the parameters set forth in the approved Engineering Report.

B. Generally, all water mains shall be located, where practical, in:

(1) Legally established road rights-of-way.

(2) Legally established permanent easements for such purpose, and immediately adjacent to legally established road rights-of-way or paved areas either existing or as proposed by the designer in accordance with Chapter 1.7 "Easement Requirements" of these Standards.

(3) Paved Areas.

C. Construction shall generally be parallel to the center line of roads or easements. The same offset shall be used throughout except when existing utilities dictate a change in offset along the proposed line.

D. Water mains shall be installed a minimum of 10 feet from any part of a structure.

E. In general, main line valves are required at intervals of 1000 feet or less and at tees (3 each) and crosses (4 each) to allow adequate control of the system without major system shutdowns.

04.2.02 System Design

A. The proposed facilities together with the pertinent existing facilities shall be evaluated with current water model software, specifically, WaterCad by Bentley or approved alternate. This model data shall be provided to the Department for review.

B. Dead end lines shall be minimized by looping mains. Where looping is required the minimum size pipe shall be 6 inches. If lines cannot be looped a fire hydrant or blow off shall be provided at the end of the line.

4.2.03 Demand Design

Maximum rates of water consumption shall be calculated and used as a basis of hydraulic design. Average daily water consumption rate values for the number and type of consumers anticipated to be served shall be based on those contained in the State of Virginia "Waterworks Regulations." Any such rates not given or deviations from tabulated rates shall be estimated and justified by the Design Engineer and approved by the Department.

4.2.04 Fire Protection

A. Rates of flow for fire protection shall be estimated based on the most current I.S.O. Fire Suppression Rating Schedule, Section I, Public Fire Suppression, Subsection 300, Needed Fire Flow, including Definitions Extracted From the CFRS and including Occupancy Classifications, Non-Manufacturing and Occupancy Classifications-Manufacturing and Special Hazards. Final approval of fire protection for structures shall be by the City Building Official.

B. The minimum fire flow from any individual fire hydrant shall be 750 gpm. The minimum residual pressure at maximum flow shall be 20 p.s.i.

C. During maximum rated fire flow conditions, the pressure drop in any fire protection system shall not exceed 15 PSI from the point of connection at the existing City system to any fire hydrant or any combination of required hydrants.

D. The minimum size water line used for fire protection to properties zoned for single family residential shall be 6 inches in size. The minimum size water line used for fire protection to properties zoned multi-family residential, commercial or industrial shall be 8 inches in size.

E. The minimum sized fire service lines above shall be looped to provide feed from at least two directions. Not more than one fire hydrant shall be installed on a 6" dead end line.

F. Dead end lines shall not contain more than 600 feet of the minimum sized line. Additional lengths required shall be provided by increasing the line size.

G. Fire hydrants shall be placed within street or easement right-of-way.

H. Where practical, fire hydrants shall be placed at high and low points on the line.

I. Fire hydrant spacing for properties zoned agricultural or single family residential shall not exceed 700 feet or require a hose lay of over 350 feet from the hydrant to any part of any structure to be protected.

J. Fire hydrant spacing for properties zoned multi-family residential, commercial or industrial shall not exceed 500 feet or require a hose lay of over 250 feet from the hydrant to any part of any structure to be protected.

K. Valves for fire hydrants shall be located in the street pavement where practical.

L. No fire hydrant shall be placed closer than 50 feet from the face or overhang of any building to be protected.

M The above criteria for spacing fire hydrants may be modified by the Department to improve fire hydrant accessibility for fire fighting purposes.

N. Structures protected by automatic sprinkler systems require installation of a double detector check, dedicated fire hydrant, and a siamese connection. The detector hydrant is not credited toward external protection requirements. Siamese connections must be located within 50 feet of the dedicated hydrant.

4.2.05 Structural Design

A. Structural requirements must be considered in the design of all water mains and appurtenances.

B. The proper strengths shall be specified for the pipe material being specified. Strength shall be based on operating pressures, depth of bury, trench width and foundation conditions. This is an engineering matter and not subject to generalization.

C. Proper blocking and/or restraints must be provided and shown on the drawings. Where blocking is not detailed on the drawings, restrained joints shall be used.

D. Proper support shall be provided for aerial or suspended lines.

E. Any potable waterline crossing above surface water must be:

1. Adequately supported.

2. Protected from freeze damage.

3. Accessible for repair or replacement.

4. Above the 100-year flood plain elevation.

F. Any potable waterline crossing under surface water must meet the following requirements:

1. The pipe shall be of special construction having flexible watertight joints.

2. Valves shall be provided at both ends of the water crossing so that the section can be isolated for test or repair; the valves shall be easily accessible and not subject to flooding.

3. Permanent sample taps shall be available at each end of the crossing and at a reasonable distance from each side of the crossing, for the purpose of testing the section of line crossing the surface water, and for locating leaks in that section.

4.2.06 Backflow Prevention

A. The City's distribution system shall be protected from contamination by the installation of check valves at all service lines.

B. Potable water services thru 2" shall have a double check valve installed in the customsetter.

C. Potable water services above 2" shall have a separate Double Check Assembly installed in conjunction with the water meter.

D. Fire service lines shall have Double Check Detector Assembly installed in line.

E. Greater protection may be required in the form of an RPZ valve depending on the degree of hazard being posed.

4.2.07 Miscellaneous Considerations

A. The minimum size water line pipe to be used for normal domestic water service shall be 6 inches and be capable of supplying 3 gpm per residential connections at 30 p.s.i. under average flow conditions. The minimum working pressure (under flow) of 20 psi at the service connection shall be maintained based on the maximum hour of maximum day plus applicable fire flows.

B. Air, air/vacuum or pressure reducing valves, blow-off tees and related fittings shall be provided. The type, size, etc., shall be specified by the Design Engineer, subject to approval by the Department.

C. The normal depth of cover for water mains shall be 3'. Additional depth shall be provided where required for thrust restraint or to clear underground obstructions.

D. Water mains shall be designed to go over storm and sanitary sewers where practical.

E. The profile of water services at ditch lines shall be shown on plans and have a minimum of 30" cover at the ditch invert.

F. Where pressure is less than 40 psi in a building structure a booster pump to service that building shall be required per the Uniform Statewide Building Code.

G. Where pressure is greater than 80 psi in a building structure a pressure reducing valve to service that building shall be required per the Uniform Statewide Building Code.

4.3 DRAWINGS

4.3.01 In addition to the requirements of Chapter 1.6 - "Drawings Organization and Format" of these Standards, the drawings shall incorporate the following features:

A. Drawings for water lines shall show stationing, pipe size, bearings deflection angles and curve data.

B. The drawings shall also show all fire hydrant and water service connections. Fire hydrants and water services over 3/4 inch in size shall be shown in plan and profile views which are labeled by stations.

C. Profiles shall be provided for all water lines. Grades shall be calculated and shown on the profiles. Profiles shall also show all air, air/vacuum relief valves, fire hydrants, and blow off locations.

D. Water lines shall be referenced by distances from right-of-way lines, buildings and other utilities.

E. Blocking and/or restraint details.

F. All drawings for water mains crossing sewers, force mains or other utilities shall show points where crossings occur. Crossings shall be shown in both Plan and Profile. The Profile shall clearly indicate vertical clearance between utilities.

G. Meter sizing form, backflow prevention details and ISO calculations shall be provided.

H. All fittings to include valves, bends, tees, etc. shall be shown on the plan and profile.