CITY OF FORT SMITH
MINIMUM WATER DESIGN STANDARDS

1. SCOPE

No water improvement facilities shall be constructed, altered, extended or reconstructed within the City of Fort Smith or the planning jurisdiction of the City of Fort Smith without first having the approval of the City of Fort Smith Public Works Department and the Arkansas State Health Department. All such construction shall meet the requirements included herein.

2. GENERAL REQUIREMENTS AND DESIGN CRITERIA—WATER LINES

2.1 Design Period

In general, the water improvements shall be designed for the estimated ultimate tributary population. This shall be deemed to be 80% of the maximum population on the land per zoning ordinances. Consideration shall be given to the maximum anticipated demand of uses such as institutions and industrial parks also.

2.2 Design Factors

In determining the required capacities of water mains the following factors should be considered.

1. Maximum hourly demands.
2. Fire Flows.
3. Additional demands from industrial and commercial users.
4. Static pressures and topography.
5. Residual pressures.

2.3 Design Basis

2.3.1 Per Capita Flow

Water systems shall be designed on an average daily per capita usage of 100 gallons. Peak daily flows shall be designed at 2.5 times average daily flows and peak hourly flows shall be considered 7 times average daily flows. Lines less than 6" in diameter shall be designed for an instantaneous flow of 20 gallons per minute per residence.

2.3.2 Fire Flows

2.3.2.1 In residential areas with single family and duplex housing water
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lines shall be designed to furnish a minimum of 500 gallons per minute each from two adjacent hydrants.

2.3.2.2 Areas of commercial, industrial, and high density multi-family higher fire flows from 1500 to 3000 gallons per minute will be required.

2.3.2.3 In high valve districts with no space between buildings and structures in excess of 3 stories allowed the design fire flows shall be up to 6000 gpm.

2.3.3 Design Pressures

All lines 6" and larger shall be designed to carry the flows for both fire protection and the flow for the peak day domestic usage at a point where the minimum residual pressure is 20 psi at any point in the system. Lines smaller than 6" diameter shall be designed on an instantaneous flow of 20 gallons per minute per residence for the first 5 residences and 10 gallons per minute for additional residences to be served off the lines. The minimum pressure within the system on both designs shall be 20 psi.

2.3.4 Commercial and Industrial Usage

Commercial and industrial areas water requirements shall be individually designed based on the proposed development in the areas. The minimum peak hourly design flow shall be 10,000 gallons per day per acre in addition to fire flow requirements. Maximum design flows shall be based on the available supply to heavy industrial users.

2.3.5 Velocities

Water lines shall be designed such that the peak flow velocity does not exceed 9 feet per second in the line.

2.4 Details of Design - Construction Water Line
2.4.1 Minimum Line Sizes

2.4.1.1 No public water line shall be less than 6" in diameter except for the following case:

Two inch looped lines or three inch dead end lines will be allowed where no future extension of the line is possible and the lines will not be required to carry fire flows and the property will be within the required radius of a fire hydrant on a main of adequate size.

2.4.1.2 All lines in commercial areas, high density, multi-family residential areas and industrial areas shall have a minimum line size of 8" where lines may carry fire flows.

2.4.2 System Design

2.4.2.1 Water systems shall be designed wherever possible in a gridiron configuration to assure adequate continuous supplies and promote circulation. Dead end lines shall be avoided wherever possible.

2.4.2.2 Where it is not possible to avoid a dead end line, the dead end line shall end with either a fire hydrant or blow off assembly.

2.4.3 Depth

Water lines shall be designed for a minimum cover of 30" except where rock is encountered, at which time the cover may be reduced to 24".

2.4.4 Separation of Water and Sewers

2.4.4.1 Water and Sewer Interconnections

There shall be no physical connection between any water supply
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system and any storm or sanitary sewer system, or any appurtenance thereto which would permit the passage of polluted water into the potable supply.  

2.4.4.2 Horizontal Separation  
Water mains shall be laid with a minimum of 10' horizontal separation from sanitary sewer.  

2.4.4.3 Vertical Separation  
Whenever possible a water main shall be laid at least 18 inches above a sanitary sewer. Should this not be possible the sanitary sewer will be replaced with a material approved for both water mains and sanitary sewers for a distance of at least 10 feet in each direction from the proposed water line. Where the new sewer pipe connects with the old pipe a water tight connection shall be made then a concrete collar poured of a minimum size of the pipe O. D. plus 12 inches in all directions from the sanitary sewer joint.  

2.4.5 Easements  
All water lines not in public right-of-way shall be in a utility easement dedicated for public use with a minimum width of 15 feet.  

3. Details of Design  
3.1 Hydrant Spacing  
Fire hydrants in single family and duplex residential areas shall generally be installed at street intersections with intermediate hydrants where necessary such that the hydrant spacing will not exceed 750 feet. No lot shall be in excess of 350 feet from a hydrant within the new developments. In high density residential, commercial and industrial areas fire hydrants shall be placed at maximum intervals of 300 feet.
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with hydrants again generally located at intersections. No tract or lot shall exceed 300 feet from a hydrant.

3.2 Hydrant Types

All hydrants shall be three way hydrant with two 2 1/2" outlets and one 4 1/2" outlet. They shall be of a design such that if the barrel is broken the hydrant will remain closed.

3.3 Hydrant Connections

Hydrants shall be connected to the main with a pipe of not less than 6" in diameter. A gate valve shall be installed on all lines connecting the hydrants to the water main.

3.4 Valves

Valves shall be arranged such that small segments of the water system can be shut down for repairs without putting large areas out of water. As a general rule all lines shall have valves of the same size of the line installed where the lines intersect connections exceeds one-quarter mile.

3.5 Air Release Valves and Blow Offs

Where lines cross hill tops air release valves and in low points blow offs may be required. These appurtenances nor the pits these are placed on shall be interconnected with or drained into any storm or sanitary sewer.

3.6 Flooding

All appurtenances to the water lines including valves shall be located in locations accessible and not subject to damage in the 100 year return storm.

3.7 Service Lines

In all areas where the water line is proposed to serve the property on the opposite side of the street, a conduit of a minimum size of 2" in diameter shall be installed underneath the street surface. The service line shall be pushed through this conduit at the time of construction if proposed. It will be permissible to use 3 inch or 4 inch conduits at alternate lot lines installed such that two services can be installed through
a single conduit. In industrial and commercial areas the method of serving each lot shall be individually determined by the proposed usages in the subdivisions. It will be required that each lot is furnished with a method of providing adequate water service without open cutting the streets. This may be accomplished by installing conduits or partial installation of service line with valving. All lots will have an independent service line from the main to the meter.

4. DESIGN DATA, MAPS, COMPUTATIONS, PLANS AND SPECIFICATIONS

4.1 All designs, plans and specifications submitted to the City for approval for the construction of water improvements as required herein shall be prepared under the direction of a professional engineer, licensed in the State of Arkansas, and shall meet the minimum standards specified herein.

4.2 Plan Requirements

Plan sizes shall be uniform for each set. Where practical plan and profile sheets of approximately 24 x 36 inch are preferred. The plans shall include:

4.2.1 Locations of the project with respect to well known roads, street, subdivisions or survey lines. Key map improvements, both existing and to-be-constructed.

4.2.2 Plans for each water line showing locations, size, design flow, materials and boring information and rock elevations where known along the water line, locations, depths and sizes of adjacent or crossing sewer lines and utilities and special construction requirements such as bedding, easement, backfill, size and class of pipe, etc.. All elevations shall be based on USGS or USC & E bench marks. All plans shall indicate a bench mark on each sheet. No location within a subdivision shall be in excess of one-quarter mile from a bench mark that will be in existence at the end of the project. These bench marks shall be shown on both construction and as built plans.

4.2.3 All elevations shall be based upon USGS datum with location of bench marks given.
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4.2.4 Details of special structures, services, trestles, sewer line crossings and bedding, all adequately detailed and dimensioned.

4.2.5 Prior to tentative acceptance of any project as built plans will be submitted and reviewed by the City of Fort Smith. These plans shall provide all information required in the above paragraphs with the addition of information of materials actually used for constructions, rock elevations, depth of conflicting utility and sewer lines where known. All valves shall be tied down on details of a scale of not less than one inch equal 30 to permanent objects such as the back of curb, fire hydrants or similar objects that can be easily found in the field by maintenance crews.

5. PLAN CHECKOFF SHEET

Each set of plans shall be checked prior to submittal to assure that the following items are included in the submittal:

1. Plans to a scale of not less than one inch equal 100.
2. Project Specifications.
3. Project Detail Sheet.
5. Copy of letter to State Health Department.
6. Design Calculation, including the following:
   (a) Projected population to be served.
   (b) Maximum line velocities.
   (c) Design heads at various points in the system including critical head with calculations to justify all of the above.
   (d) Services to all lots, size and type.
   (e) Adequate valve spacing.
   (f) Hydrant service circles.
(g) Separation from sanitary sewers.
(h) Adequate easements and right-of-way to be shown.
(i) Street services to be crossed, type and length.
(j) Existing obstructions along line and surface features.