# APPENDIX C

# WATER SUPPLY

# APPENDIX C – WATER SUPPLY

## Water Distribution System Design Criteria

## Commonly Used Criteria

# Water Distribution System Design Criteria

**CITY OF SACRAMENTO**
**WATER DISTRIBUTION SYSTEM DESIGN CRITERIA**
**SUMMARY SHEET**

| | | | | | |
|---|---|---|---|---|---|
| **Min. System Pressure** | * | Peak Hour Demand | 30 | psi | "Design & Procedures Manual", Sect. 13.4.1 |
| | * | Maximum Day plus Fire Flow | 20 | psi | " |
| **Max. System Pressure** | * | | 50 | psi | City Plant Operations & Distribution System Maintenance |
| **Max. Velocity @ Peak Hour** | | | | | |
| **Distribution Mains** | * | 6" dia. | 4 | fps | "Water Dist. Master Plan" Oct. 1996, Black & Veatch |
| | * | 8" - 12" dia. | 5 | fps | " |
| **Transmission Mains** | * | 18" dia. | 4 | fps | " |
| | * | 24" dia. and above | 5 | fps | " |
| **Max. Velocity @ Max. Day plus Fire Flow** | | | | | |
| **Distribution Mains** | * | 6" dia. through 12" dia. | 10 | fps | "Water Dist. Master Plan" Oct. 1996, Black & Veatch |
| **Transmission Mains** | * | 18" dia. and above | 6 | fps | " |
| **Fire Flow Demands (1)** | * | Single Family | 1,500 | gpm | City's Fire Protection Engineer |
| | * | Multifamily | 2,000 | gpm | " |
| | * | Commercial | 3,000 | gpm | " |
| | * | Industrial | Contact Fire Engineer | | " |
| | * | Special Structures | Contact Fire Engineer | | " |
| **Average Day Demand** | * | Residential | 630.00 | (gpd/unit) | "Estimate of Ultimate Annual Water Use", Oct 1991,Boyle Eng. |
| **Land Use Factors** | * | Multi-family | 225.00 | (gpd/unit) | "Estimate of Ultimate Annual Water Use", Oct 1991,Boyle Eng. |
| | * | Resid. - Low/Med Density | 3.60 | (acre-ft / acre-yr) | " |
| | * | Resid. - High Density | 4.00 | (acre-ft / acre-yr) | " |
| | * | Neighborhood Commercial | 3.00 | (acre-ft / acre-yr) | " |
| | * | Neighborhood Office | 3.00 | (acre-ft / acre-yr) | " |
| | * | Regional Commercial | 3.00 | (acre-ft / acre-yr) | " |
| | * | Regional Office | 3.00 | (acre-ft / acre-yr) | " |
| | * | Highrise Regional Office | 10.22 | (acre-ft / acre-yr) | " |
| | * | Public Office | 3.00 | (acre-ft / acre-yr) | " |
| | * | Warehouse | 3.00 | (acre-ft / acre-yr) | " |
| | * | Industrial | 4.00 | (acre-ft / acre-yr) | " |
| | * | Employee Intensive Industrial | 3.50 | (acre-ft / acre-yr) | " |
| | * | Parks & Recreation | 4.20 | (acre-ft / acre-yr) | " |
| | * | Parks & OS > 4 acres | Supplied by ground water irrigation wells | | |

**CITY OF SACRAMENTO**
**WATER DISTRIBUTION SYSTEM DESIGN CRITERIA**
**SUMMARY SHEET - Continued**

| | | | | | |
|---|---|---|---|---|---|
| **Land Use Factors** | * | Schools | 2.50 | (acre-ft / acre-yr) | " |
| | * | Utilities | 0.10 | (acre-ft / acre-yr) | " |
| | * | Public Misc. | 0.70 | (acre-ft / acre-yr) | " |
| **System Losses** | | Average 7.5 Percent | | | " |
| **Peaking Factors** | * | Max. Day Demand to Average Day Demand | 1.8 | multiplier | "Water Dist. Master Plan" Oct. 1996, Black & Veatch |
| | * | Peak Hour Demand to Max Day Demand | 1.3 | multiplier | "Water Dist. Master Plan" Oct. 1996, Black & Veatch |
| **Hazen-Williams Coefficient** | * | New Pipe | 130 | | Industry Standard |
| (1) Consult City of Sacramento Fire Protection Engineer @ 264-5936 | | | | | |
| **Distribution main layout:** | | | | | |
| | | **Residential (single family)** | | | "Design & Procedures Manual", Sect. 13.4.2 |
| | * | Twelve inch diameter mains on square mile grids. | | | |
| | * | Eight inch diameter mains on quarter mile (1300 feet) grids. | | | |
| | * | Six inch diameter mains within remainder. | | | |
| | | **Multi-Family, Office, Limited & General Commercial, Light Industrial** | | | "Design & Procedures Manual", Sect. 13.4.3 |
| | * | Twelve inch diameter mains on one-half mile grids. | | | |
| | * | Eight inch diameter mains within remainder. | | | |
| | | **Heavy Commercial/Industrial, Manufacturing Industrial Parks** | | | "Design & Procedures Manual", Sect. 13.4.3 |
| | * | Twelve inch dia. mains throughout distribution system. | | | |
| **Circulating Water Mains - Maximum length of a circulating or looped water main with two or more tie-in connections.** | | | | | "Design & Procedures Manual", Sect. 13.4.4 |
| | * | Six inch diameter main is limited to a max. length of 1500 feet. | | | |
| | * | Eight inch diameter main is limited to a maximum length of 2000 feet. | | | |
| | * | Twelve inch diameter main is required if length of circulating main exceeds 2000 feet. | | | |
| **Dead End Mains** | | | | | "Design & Procedures Manual", Sect. 13.4.5 |
| | * | Six inch diameter main is limited to a maximum length of 600 feet. | | | |
| | * | Eight inch diameter main is limited to a maximum length of 1200 feet. | | | |
| | * | Twelve inch diameter main is limited to a max. length of 2400 feet. | | | |

* Water transmission mains are NOT to be tapped for the installation of water services or fire hydrants.
* Redundant distribution water mains may be required to parallel transmission mains in order to meet water demands during a transmission main outage.
*Locations of distribution main tie-ins to transmission mains will be determined on a case-by-case basis.

file: c:\new_development\distsystem\criteria.wk1 - Source: City of Sacramento, Utilities Department

# Commonly Used Criteria

## DEPARTMENT OF UTILITIES
## WATER DISTRIBUTION SYSTEM - COMMONLY USED CRITERIA

July 1998

This document summarizes the commonly used planning and design criteria for the City's water distribution system. For additional information please reference the City's "Standard Specifications", "Design and Procedures Manual", "Uniform Fire Code", and "City Code".

## System Requirements:

### General Requirements:

***System Reliability:***

The City requires a reliable water distribution system that guarantees that no more than 40 dwelling units (or equivalent water demand) shall be affected by a water main shut down. This may require redundant mains and/or a redundant water supply.

***Main Placement:***

Water mains shall be placed along the centerline of new streets. For wide streets with dual water mains, the water mains shall be placed no closer than 8 feet from the center of the main to the lip of gutter.

For water mains located within public easements, the mains shall be placed no closer than 5 feet to the easement boundary line. The recommended minimum easement width for water distribution mains is 15 feet.

***Separation:***

Water mains are to be placed to provide 10 feet of horizontal clearance from parallel sanitary sewer lines in all streets where the width of street right-of-way is adequate and there is no interference from other utility lines.

***Min / Max Cover:***

The minimum depth of cover over water mains in areas of new street construction is 36 inches and 54 inches for unimproved streets. The maximum depth of cover for water mains in new streets or existing streets with full improvements (curbs, gutters, and sidewalks) is 48 inches. Depth of cover is measured from the top of the pipe to finish grade or pavement surface.

### Transmission Mains:

***Definition:***

Pipeline used to transport water from the treatment plant to the distribution system. Generally, transmission mains are 18-inches in diameter and larger.

***Layout:***

Transmission mains shall be sized and placed per the Engineering Department of Utilities.

***Design:***

Transmission mains shall be designed and constructed per the Department of Utilities' special provisions for water main construction and the technical water transmission main drawings. Transmission mains shall be designed and constructed by the Department of Utilities unless other arrangements have been made between the City and a developer.

***Blow-offs & Air/Vacuum Relief:***

At a minimum, there should be a blow-off and an air/vacuum relief valve installed between valves. Blow-offs should be located at the low points of the pipe and air/vacuum relief valves should be located at the high points of the pipe.

***Access Manholes:***

Access manholes should be constructed every 2,000 linear feet and spaced between valves.

***Dead End Mains:***

Dead end transmission mains shall have a valve and a minimum of 3 feet of pipe with a dish head. The dish head shall have a plugged 4-inch outlet to attach a pipe with a valve for filling, testing, and disinfecting the transmission main.

***Approved Pipe Materials:***

The City prefers using ductile iron, concrete cylinder, or welded steel pipe for water transmission main projects. Use of an alternative pipe material requires written approval from the Department of Utilities, Engineering Division.

***Corrosion Control:***

Based on soil conditions and the surrounding environment, additional corrosion protection besides pipe coating may be required.

***Taps:***

Transmission mains shall only be tapped with distribution mains. The location of outlets, connections, and appurtenances shall be approved by the Department of Utilities, Engineering Division. Water services or fire hydrant taps shall NOT be allowed on transmission mains.

**Distribution System:**

***Definition:***

Distribution mains are pipelines that carry water from the transmission mains to the consumer. Distribution main are generally 12-inch in diameter and smaller. Distribution main sizes shall be 6, 8, or 12-inch diameter (4, 10, 14, and 16-inch diameter mains are not currently installed).

***Layout:***

The developer is responsible for laying out a water system within the development that meets the minimum distribution system grid, and satisfies the more critical of the following two conditions:

- At maximum day peak hour demand, the operating or "residual" pressure at all water service connections shall be a least 30 psi.
- At average maximum day demand plus fire flow, the operating or "residual" pressure in the area of the fire shall not be less than 20 psi.

***Minimum Distribution System Grid:***

Residential (single family)

- Twelve inch diameter mains on square mile grids.
- Eight inch diameter mains on quarter mile (1,300 feet) grids.
- Six inch diameter mains within remainder.

Multi-Family, Office, Limited & General Commercial, Light Industrial

- Twelve inch diameter mains on one-half mile grids.
- Eight inch diameter mains within remainder.

Heavy Commercial/Industrial, Manufacturing Industrial Parks

- Twelve inch diameter mains throughout distribution system.

***Circulating Water Mains (maximum length of a circulating or looped water main with two or more tie-in connections)*:**

- Six inch diameter main is limited to a maximum length of 1,500 feet.
- Eight inch diameter main is limited to a maximum length of 2,000 feet.
- Twelve inch diameter main is required if length of circulating main exceeds 2,000 feet.

***Dead End Mains:***

Water mains with only one supply source. Dead end mains shall be provided with a means of flushing.

- Six inch diameter main is limited to a maximum length of 600 feet.
- Eight inch diameter main is limited to a maximum length of 1200 feet.
- Twelve inch diameter main is limited to a maximum length of 2400 feet.

***Dual Water Mains:***

Dual water distribution mains, one water pipeline along each side of the street, may be required for all new streets constructed with a raised center median separating opposing lanes of traffic or right-of-way width of 100 feet or more. Dual mains may be required for streets less than 100 feet on a case-by-case basis.

***Gate Valves:***

In the design of water distribution systems, gate valves shall be the same size as the water main. The gate valves shall be placed adjacent to or within 3.5 feet of tee or cross fittings. In-line gate valves shall also be placed along water distribution mains at the following maximum intervals:

- No more than 1,200 feet apart for water mains 8-inches in diameter and smaller.
- No more than 1,500 feet apart for water mains 12-inches in diameter.
- Gate valves should be placed such that a maximum of 40 dwellings units would be affected by a water main shutdown.

Where valves are installed in long runs, valves shall be installed next to a fire hydrant branch. The fire hydrant is installed to locate the valve during an emergency.

***Fire Hydrants:***

Fire hydrant spacing shall follow the guidelines presented in the Uniform Fire Code Appendix III-B. In general, hydrants shall be spaced 500 feet apart in residential areas. Commercial areas will vary depending on required fire flow.

Fire hydrant leads shall match the pipe diameter of the main except when connected to a 12-inch main or larger in which case the lead shall be an 8-inch pipe.

***Design:***

Distribution system design shall be per the City's Public Works Department Design and Procedures Manual and Standard Specifications.

***Approved Pipe Materials:***

The City prefers using PVC or ductile iron pipe for water distribution projects. Use of another pipe material requires written approval from the Department of Utilities, Engineering Division.

***Taps:***

- Only one domestic water service per parcel is allowed unless otherwise approved by the Department of Utilities, Engineering Division.
- All new domestic and irrigation water services shall be metered.
- Multiple fire services maybe allowed per parcel. Fire services are not metered.
- All water connections shall comply with the City of Sacramento's "Cross Connection Policy".

***General Conditions:***

- If a proposed development is not contiguous to an existing public water main, the developer shall be responsible for the installation of any required off-site distribution system extensions.
- To be eligible for water service, the property to which service is to be extended must abut a dedicated public easement in which a city water main is constructed at a point immediately adjacent to the property. ***Exception:*** For landlocked parcels, the point of service shall be adjacent to the public right-of-way where the main is located. The service shall extend from the public main to the landlocked parcel within a private easement.
- Two points of connection to the public water distribution system is required for new subdivisions.
- When water main extensions are required for commercial or industrial development, the mains shall be extended along the full frontage of the property.

Source: City of Sacramento, Utilities Department