

3.6 CULINARY WATER DESIGN. All culinary water mains and appurtenances within the City of St. George shall be designed to provide for adequate future service for all contiguous areas which may, within a twenty year period in the future, be tributary thereto. Water trunk lines shall be designed in accordance with the system master plan.

3.6.1 DESIGN FLOW PRESSURE. Water mains shall be designed to provide a minimum residual pressure of twenty (20) psi under maximum day demand conditions including designed fire flow (as called out in SECTION 3.6.7 of these Standards). A minimum of forty (40) psi residual pressure must be maintained under normal peak hour conditions without fire flow.

3.6.2 FLOW DESIGN CRITERIA. Flow design criteria shall conform to the requirements outlined in the current edition of the State of Utah Rules for Public Drinking Water Systems, Section R309-1-5 "Quantity Requirements" and R309-112 "Distribution System". In any case where these specifications require a higher design standard than is contained in the referenced Rules, the higher design standard shall take precedence.

Peak instantaneous flow for outdoor use shall be assumed as follows:

Indoor Peak Instantaneous Flow multiplied by two.

Peak instantaneous fire flows shall be added to peak instantaneous domestic flows for distribution system design flow total.

Commercial or industrial areas may require special investigation to determine fire flow requirements. Existing and future static pressure and flow information used in the design must be approved by the Water Department.

3.6.3 MINIMUM SIZE AND DEPTH. The minimum depth of cover (to the top of the pipe) for water mains shall be three feet below the final grade of the street with a maximum of 10 feet unless otherwise approved by the Water Department. Where final grades have not been established, mains shall be installed to a depth great enough to ensure a minimum of three feet and a maximum of ten feet of cover below future grade. The water mains shall be sized to deliver the peak instantaneous flow rate as previously outlined. The fire flow requirements and pressures shall be as previously outlined. The size of the pipe shall also be based on a five (5) foot per second (fps) velocity maximum at peak instantaneous flows. However, the minimum water main size to be installed shall be eight inches in diameter unless otherwise approved by the Water Department.

Departures from the minimum requirements will be considered only in

special circumstances. Water mains in cul-de-sacs, internal streets within subdivisions, and other areas where water mains will not be extended in the future, may be six inches in diameter if that size water main meets the development's water demand requirements. Any departure from minimum requirements identified above shall be justified by a network hydraulic analysis.

A fire hydrant shall not be connected to a main which does not have sufficient fire flow capacity. *as required by International Fire Code requirements. Appendix B and C.*

In locations where the City has determined line size for the future based on a Masterplan Study, the master-planned line size will be installed.

3.6.4 VALVES AND HYDRANTS. The water system shall be looped and valves shall generally be spaced such that a break in any one length of main will put no more than six hundred feet of main, nor more than two fire hydrants, out of service (whichever is less) while maintaining adequate minimum service in the remainder of the water system during repairs, except for major transmission lines, where longer spacing may be allowed. All distribution mains connecting to larger transmission mains shall be valved at the connection. All fire hydrant runs shall also be valved at the distribution main.

Valves shall generally be located at street intersection.

3.6.5 PRESSURE REDUCING VALVES. Pressure reducing valves shall be installed on main lines where designated by the City Water Department. The standard design for these pressure reducing valves and vaults shall be provided by the City Water Department.

3.6.5.1 SECONDARY PRESSURE REDUCING VALVES. The Water Department requires that in high-water-pressure zones (greater than 80 psi), secondary pressure reducing devices be installed by the building owner on all water connections to buildings. The locations of the high-water-pressure zones within the City can be located and identified upon request from the Water Department.

3.6.6 FIRE HYDRANT SPACING AND LOCATION. Generally, fire hydrants shall be spaced and located as follows:

3.6.6.1 At each intersection, generally on the same sides of the street.

3.6.6.2 In residential areas, fire hydrant spacing shall be no greater

than five hundred feet and no house shall be more than two hundred fifty feet from a hydrant measured along a street access to the property being served.

3.6.6.3 In multiple family areas, PUD zones, P.D. zones, industrial, business or commercial areas, fire hydrant spacing shall require special investigation to determine the hydrant spacing per Appendix ~~411-B~~ ^{B and C} of the Uniform Fire Code (UFC). (Generally, spacing shall be no greater than three hundred fifty (350) feet and all commercial buildings shall be within one hundred seventy-five (175) feet of a hydrant.)

Informational

3.6.6.4 Generally, hydrants shall be located in line with extensions of the property line when located mid-block.

3.6.6.5 Hydrants shall be placed no more than five (5) feet from the back of the sidewalk. Where sidewalk is not adjacent to the curb and a four (4) foot wide or wider planter area exists, the hydrant may be placed in the planter no closer than two feet from the back of the curb. Provide a five (5) foot elliptical radius of clearance to adjacent obstacles with the lowest water outlet not less than eighteen (18) inches nor more than thirty (30) inches from the final ground elevation (see standard drawings). The "break-away" flange at bottom of hydrant shall be installed so that it is at, or within six (6) inches above, final ground elevation.

3.6.6.6 All fire hydrants shall be owned, and maintained, ^{tested,} by the Water Department and shall be installed on dedicated easements or public rights-of-way.

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3.6.6.7 A fire hydrant shall be placed in the end of all cul-de-sacs or on dead end lines.

Fire hydrants shall not be located:

- A. within five feet of a driveway, power pole, light standard, or any obstruction
- B. or, within three (3) feet of any block wall or fence when measured to the rear of the hydrant.

3.6.7 FIRE FLOW REQUIREMENTS. Under maximum day demand conditions, fire flow shall be at least seven hundred fifty (750) gallons per minute at any one hydrant with a total fire flow of at least one thousand

C. No obstruction, fence, or landscaping ~~other than~~ ^{other than may} be placed ~~within~~ ^{within} 6 feet on either side of any fire hydrant. The front of the hydrant must remain unobstructed ^{to} the street or driveway it faces, and clearly visible from

five hundred (1,500) gpm at any combination of two hydrants in the area, and/or must meet the requirements of the Federal Insurance Service Office. The total system design shall be such that fire flows and normal peak instantaneous flow demand (as called out within this sub-section) can be met while still maintaining a minimum pressure of twenty (20) psi at all points in the distribution system.

A maximum water velocity of ten (10) feet per second shall be utilized when designing for fire flows and/or other emergency conditions.

High density residential, commercial or industrial areas shall require special investigation to determine fire flow requirements and hydrant spacing per the ~~Uniform~~ Fire Code (UFC). Appendix ~~A, B~~ B and C

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Existing and future static pressure and flow information used in the design shall be approved by the Water Department.

3.6.8 MISCELLANEOUS WATER SYSTEM DESIGN CRITERIA.

3.6.8.1 All public water mains shall be installed in a public rights-of-way, dedicated roadway, or designated drainage way, with adequate access for maintenance vehicles. Pipelines will not be installed on back lot or side lot lines due to potential flood and other damage.

3.6.8.2 Dead-end mains shall be avoided wherever possible and if installed, shall not exceed ~~six hundred feet~~ *in length from a looped ^{water} line.* Hydrants shall be located at the end of dead-end mains and cul-de-sac mains for flushing purposes as well as for fire protection. Blow-off valves rather than fire hydrants are not desirable except where warranted by special circumstances as determined by the Water Department. Blow-off valves shall be installed per the standard drawings.

3.6.8.3 Each building or lot shall be served by a separate line and meter except in PUD's as approved by the Water Department. In some situations a common tap and service line from the main to a manifold with two meter setters and boxes may be installed to serve two adjacent properties. All lots shall have a minimum of three quarter (3/4) inch service line from the main to the meter box. Multiple housing of two units, or more, shall have a minimum of one (1) inch service. When there are more than two multiple housing units the service line shall be sized accordingly.

3.6.8.4 All service line taps shall be machine tapped at the time of the water main installation. Service lines shall be installed prior to testing and acceptance of the water main.

3.6.8.5 Water mains shall be laid at least ten (10) feet horizontally from any existing or proposed wastewater main. The distance shall be measured edge to edge. If necessary, and where approved by the City's Representative, SECTION 12.2.1 of the State of Utah Public Drinking Water Regulations can be implemented.

3.6.8.6 When a water main crosses over a wastewater main, the water main shall be laid at such an elevation that the bottom of the water main is at least eighteen (18) inches above the top of the wastewater main. When the water main cannot be as high as eighteen (18) inches above the wastewater main, the wastewater main shall be constructed of material with pressure conduit standards for a distance of ten feet on either side of the crossing.

3.6.8.7 All tees, bends, plugs and hydrants shall be provided with reaction blocking, tie rods, and/or joints designed to prevent movement, i.e. "mega lug" or approved equal. Wood blocking of future main extensions is not acceptable. When thrust restraints cannot be used, concrete thrust blocks shall be formed and poured in place and must bear against undisturbed soil, per the thrust block details in the standard drawings. Installation of concrete thrust blocks shall receive prior approval of Water Department.

3.6.8.8 Air release vacuum assemblies and blow-off valves shall be provided on all mains twelve inches in diameter and larger, where required, to prevent damage due to air accumulations.

3.6.8.9 All water lines shall require a fourteen gauge insulated THWN wire be installed with the line for locating purposes. The wire shall be installed and extended up at each valve and hydrant.

3.6.8.10 Sufficient valves shall be provided on water mains to minimize inconvenience and sanitary hazards during repairs. Valves shall be generally located as follows:

- A. At intervals to isolate no more than two (2) fire hydrants at any time.
- B. At minimum intervals of five hundred (500) feet in commercially zoned areas.
- C. In residential areas to isolate a maximum of thirty services (approximately six hundred (600) feet).
- D. A maximum of five valves will be required to isolate any location.
- E. Valves shall not be located in street gutters, valley gutters, or in driveways.
- F. A valve is required at the end of all temporarily dead-ended

mains. The valve location is to be a minimum of ten (10) feet upstream of the cap or blow off assembly.

G. Valved outlet(s) for future service laterals six (6) inches in diameter and larger may be installed when approved by the Water Department. (Valved outlet installation approval does not constitute a water commitment.)

H. A shut off valve immediately adjacent to the water main shall be provided for all service laterals greater than two (2) inches in diameter and for all fire hydrant laterals.

I. The Water Department may require additional valves as deemed necessary.

3.6.9 NETWORK HYDRAULIC ANALYSIS.

3.6.9.1 WHEN REQUIRED. The Water Department may require that a network hydraulic analysis be conducted by the Engineer if:

- the project is a major subdivision with an internally looped system
- the project is located in the higher elevations of a low static pressure zone
- a high fire flow demand is required (greater than 1500 gallons per minute)
- there will be extensive irrigation
- the new water plans will complete a loop on the current system, or
- as otherwise required by the Water Department.

3.6.9.2 DESIGN. The consulting engineer should request the source hydraulic grade line (HGL) from the water department prior to the initial design where a network hydraulic analysis is required. The following information shall be submitted at the time of such a request:

- location, type of development, and the acreage or number of units with the development, and
- anticipated fire flow requirements, and
- the location where the proposed water distribution system is planned to tie into the existing system.

3.6.9.3 SUBMITTAL FOR REVIEW AND APPROVAL. The network hydraulic analysis shall be submitted with the project design for review. For larger projects, such as a major subdivision, obtaining network hydraulic analysis approval prior to submitting the water plan is preferred. The Water Department shall, upon request, make a determination as to which submittal method must be followed.

The network hydraulic analysis submittal shall include two copies of the following items:

- the data input sheets, as well as the analysis results
- information about the development (i.e., type, number of acres, number of units, fire flow requirements, etc.)
- data sheet(s) outlining all assumptions (i.e. method used to assign demands to corresponding nodes and source HGL's used)
- map identifying pipe and node numbers and their locations
- fire hydrant locations
- the name and version of software used for the analysis
- elevations of junction nodes
- staging or phasing of development, and
- appropriate off-site demands.

3.6.9.4 MISCELLANEOUS. The roughness factors to be used in the analysis should be as follows:

- C equal to 100 for all unlined cast iron pipe
- C equal to 120 for existing pipe twelve inches, or less, in diameter
- C equal to 130 for existing pipe (150 for PVC) fourteen inches, or greater, in diameter
- C equal to 130 for new pipe (150 for PVC) regardless of diameter

For any other sizes or materials not covered by the above, the consulting engineer shall contact the Water Department for guidance.

When identifying the fire flow available in a network hydraulic analysis, use the hydrant located at the development's weakest point (highest point in the development and/or last hydrant on dead-end main). Also, verify the hydrant is located at a junction node.

The elevations used in the network hydraulic analysis should preferably be based on a project grading plan or the anticipated final elevation. If the final grading plan deviates significantly from the elevations used in the analysis, a revised analysis will be required.

A chart to be used as a guide to determine water consumption for various types of developments shall be obtained from the Water Department.