

CHAPTER 5 - WATER

5.00 General Approval Requirements

- A. See Chapter 1 for general construction requirements, including the requirements for extension to limits of property, and surety bond.
- B. In the City's water service area, watermain extensions are required to assure orderly and adequate extension of the water utility system. These extensions are to be in accordance with requirements of development and service availability as established by the City and the Washington State Department of Health.
- C. Water mains shall be extended to the limits of the property being served for service to adjacent parcels where directed by the City Engineer.

5.01 Planning Criteria

- A. Ensure adjacent properties can be provided water service (extend to extreme of property with adequate capacity and pressure).
- B. Demand projections:
 - 1) Unit demand, Average daily demand (ADD):
 - a) Single family residential - 160 gallons per capita per day (GPCD), or 400 gallons per day per Equivalent Residential Unit
 - b) Multi-family residential (per unit) - 80 GPCD
 - c) Nonresidential - Use WSDOH Water System Design Manual Table 3-2
 - 2) Peaking factors:
 - a) Maximum day demand (MDD) = $ADD \times 2.4$
 - b) Peak Hour Demand = Use WSDOH Water System Design Manual Equation 3-1.
- C. System parameters:
 - a) Water velocity in mains - velocities shall not exceed 10 feet per second during highest demand and fire flow.
 - b) Distribution system pressures (measured at building elevation):
 - Desirable- Minimum 50 psi
Maximum 80 psi
 - Allowable- Minimum 40 psi
Maximum 100 psi
 - c) Pressure reducing valves are required on all services when water pressure exceeds 80 psi and shall be installed on individual services rather than main lines unless otherwise directed by the City Engineer.
 - d) Reservoir replenishment - facilities (e.g., transmission mains, pump stations) shall be sized to enable storage facilities to be refilled within 1 day after an emergency or major fire.
- D. Fire flow requirements shall be as determined by the Skamania County Fire Marshal.
 - 1) Determination of available fire flow shall be computed using a computer simulated model acceptable to the City with a base demand equal to the maximum daily demand.
 - 2) Minimum system pressure during fire flow analysis shall be 20 psi at all hydrants and

throughout the water system.

5.02 General Design Standards

- A. Check that base map conforms to all requirements listed per Chapter 1.
- B. Thrust Restraint
 - 1) All thrust restraint for waterlines shall be accomplished through the use of restrained joints. Restrained joints for pipe shall be appropriately designed for the required test pressure.
 - 2) Collar thrust blocks or other special blocking designs may be used if necessary. Show all blocking on plans and profiles.
 - 3) A restraint table shall be provided in the plan set for the pipe size and fittings used.
- C. Check with City Engineer to determine how surrounding development will affect design:
 - 1) Serve to extreme of property if adjacent property has potential for future development.
 - 2) All systems shall be looped systems where possible.
 - 3) Where dead end lines cannot practically be avoided as determined by the City Engineer, a permanent blowoff capable of providing a 2.5 fps flushing velocity shall be provided along with provisions as needed for disposal of flushing water.
- D. To assure compatibility with existing system, check with City Engineer to determine hydraulic gradients.
- E. Cap end of existing water lines to be abandoned as follows:
 - 1) Asbestos cement lines: use end cap coupling and thrust blocking.
 - 2) Cast or ductile iron lines: Use M.J. cap or plug and thrust blocking.
- F. Minimum watermain size
 - 1) 8-inch minimum diameter when serving fire hydrants.
 - 2) 6-inch minimum diameter may be used in localized conditions where fire hydrants are served by looped lines, subject to City Engineer approval.
- G. One water sampling station shall be provided for every one-hundred (100) lots developed. All subdivisions with more than fifty (50) lots shall install a sampling station.
- H. No lengths of ductile iron pipe less than 3 feet in length will be allowed to be installed with the exception of valve and tee/cross connections.
- I. Local high points and local low points shall be avoided whenever possible. Air release valves shall be installed where necessary at high points in watermain to allow for release of air. Blow-off assemblies will not be required unless requested otherwise by City. Where feasible, locate hydrant assemblies at low points to allow for removal of sediments.
- J. Toning wire shall be included on all pipe installations.

5.03 Valving

- A. 500 feet maximum distance between valves on distribution mains. Long transmission mains with limited services may provide isolation valves at 1,000 foot spacing with the approval of the City Engineer.
- B. Provide valves at both ends of an easement.
- C. Valves shall be placed at all legs of watermain intersections, unless otherwise indicated by the City.
- D. Additional valving may be required for area isolation.

- E. Valves 12 inches and smaller shall be gate valves.
- F. Valves 14 inches and greater shall be butterfly valves.
- G. An in-line valve with appropriate restraint shall be placed at all temporary dead-ends that are likely to be extended in the future to facilitate future connection.

5.04 Fire Hydrants

- A. Fire hydrants shall be public if they are serviced off of a public water main, whether on public or private property. Public fire hydrants and the connecting water main shall be placed in a public easement.
- B. Fire hydrants may be private when they are located past (after) a private water meter and are served by a private water main.
- C. The number and locations of fire hydrants, fire flow requirements and fire sprinkler components will be determined by the Skamania County Fire Marshal. Following are general requirements for fire hydrant locations:
 - 1) Commercial Buildings: Fire hydrants shall be located so that no part of a commercial building is more than 250 feet from a fire hydrant measured along a route accessible to fire department vehicles. When a fire department connection (FDC) is installed in conjunction with an automatic sprinkler system, it is required to have a fire hydrant located within 40 feet of the FDC. The FDC shall be located remote from the building and outside of the building collapse zone. This area should be clearly marked "Fire Zone No Parking". No building access road can be blocked by a fire hose while making the fire department connection.
 - 2) Non-Commercial Buildings: Unless otherwise approved by the Skamania County Fire Marshal, a fire hydrant shall be placed at each street intersection, or at spacing not exceeding 600 feet. Intermediate hydrants are required when the distances to any part of non-commercial buildings exceeds 500 feet measured along a route accessible to fire department vehicles.
 - 3) Industrial and Commercial Buildings: Fire hydrants located in street right-of-way shall not be placed within 25 feet of the top of a driveway flare.
- D. Fire hydrants shall not be connected to mains less than 8 inches, or 6 inches in diameter where the length of the 6-inch main is less than 50 feet.
- E. Fireline/hydrant runs 50 feet or greater in length must be 8 inches in diameter (terminate with tee, plug and hydrant assembly).
- F. Hydrants shall be located minimum 50 feet from any building, unless approved by the Fire Marshal.
- G. As per the IFC, fire hydrants shall be located to allow a 36-inch clear space surrounding the hydrant. For example, street lights, sign posts, protective posts, or retaining walls shall be no closer than 36 inches from the nearest portion of a hydrant. There shall also be no obstructions directly in line with any of the ports of the hydrant.
- H. Piping between fire sprinkler vaults and protected buildings shall not be shown on water design.
- I. Guard posts are to be used only in parking lots when no curbs are present or in exposed areas in parking lots.
- J. Fire hydrants more than 15 feet from an approved access road or fire lane that serves a proposed building shall not be counted in any calculation of fire hydrant spacing. On-site fire

hydrants and water supplies on adjacent properties shall not be considered available, unless accessible by fire apparatus on an approved access road. Fire hydrants located on the opposite side of a roadway shall not be considered in the fire hydrant placement calculations unless specifically approved by the Fire Marshal.

5.05 Pipe Class/Protection/Cover

- A. All waterlines shall be ductile iron pipe Class 52 unless otherwise noted herein.
- B. When crossing under rockeries and retaining walls, pipe shall be installed in a steel casing that extends beyond the footings or rockery face a minimum of 5 feet and extends beyond the back of rockery or wall equal to the height of the wall or rockery or a minimum of 5 feet.
- C. Watermain depth of cover shall be 3 feet minimum and 6 feet maximum from final grade.
- D. Building setback requirements:
 - 5 feet minimum from covered parking to watermain.
 - 10 feet minimum from building (and retaining walls) to watermain.
 - 20 feet minimum easement shall be provided between buildings.

When passing between single family residential buildings which are 25 feet apart or less, Class 53 ductile iron pipe shall be used to a point 5 feet beyond the limits of building.

When passing between commercial or multifamily buildings which are 25 feet apart or less, the waterline shall be encased in steel pipe to a point 5' feet beyond the limits of the building. The casing shall be wrapped with polyethylene.

- E. All ductile iron pipe and adjacent fittings shall be encased in 8-mil polyethylene per AWWA C-105 when crossing gas lines or paralleling within 5 feet.

5.06 Clearances/Other Utilities

- A. Clearances between water and sanitary sewer mains shall be as follows:

Horizontal and Vertical Separation (Parallel)

A minimum horizontal separation of 10 feet between water lines and any existing or proposed sanitary sewers, and a minimum vertical separation of 18 inches between the bottom of the water line and the crown of sanitary sewers shall be maintained. The distance shall be measured edge to edge (i.e., from the outer diameter of the pipes.) as shown in Figure C1-2 in the Criteria for Sewage Works Design (rev. 10/2006).

Vertical Separation (Perpendicular)

Water lines crossing Sewer lines at angles including perpendicular shall be laid above the sewer lines to provide a separation of at least 18 inches between the invert of the water line and the crown of the sewer. In the event 18-inches of vertical separation cannot be achieved or the sewer line is required to be installed above the water line, the following is required.

- 1) Gravity Sewers Passing Under Water Lines: Sewer pipe shall be encased in controlled density fill (CDF) with a minimum compressive strength of 300 psi, or in a one quarter-inch thick continuous steel, ductile iron, or pressure rated PVC pipe with a dimension ratio (DR) of 18 or less, with all voids pressure-grouted with sand-cement grout or bentonite. Commercially available pipe skirts and end seals are acceptable. When using steel or ductile iron casing, the casing shall be encased in 8-mil polyethylene per AWWA C- 105. Encasement shall extend a minimum of 10- feet on each side of the crossing. One full stick of sewer pipe shall be centered at the point of crossing so that

the joints will be equidistant and as far as possible from the water line. The sewer pipe shall be the longest standard length available from the manufacturer.

- 2) Gravity Sewers Passing Over Water Lines: Waterlines shall be protected by providing:
 - a) A vertical separation of at least 18 inches between the invert of the sewer and the crown of the water line (outside of pipe to outside of pipe).
 - b) Structural support for the sewer to prevent excessive deflection of joints and settling on and breaking of the water lines.
 - c) The stick of sewer pipe shall be centered at the point of crossing so that the joints will be equidistant and as far as possible from the water line. The sewer pipe shall be the longest standard length available from the manufacturer.
 - d) The water line shall be encased in controlled density fill (CDF) with a minimum compressive strength of 300 psi, or in a one quarter-inch thick continuous steel ductile iron casing, or in a continuous pressure rated PVC pipe casing with a dimension ratio (DR) of 18 or less, with pipe voids pressure-grouted with sand-cement grout or bentonite. Commercially available pipe skirts and end seals are acceptable. When using steel or ductile iron casing, the casing shall be encased in 8-mil polyethylene per AWWA C- 105. Encasement shall extend a minimum of 10-feet on each side of the crossing.
 - 3) Pressure Sewers under Water Lines: Pressure sewers shall be constructed only under water lines with pressure rated pipe encased in controlled density fill (CDF) with a minimum compressive strength of 300 psi, or in a one quarter-inch thick continuous steel, ductile iron, or pressure rated PVC pipe with a dimension ratio (DR) of 18 or less, with all voids pressure-grouted with sand-cement grout or bentonite. Commercially available pipe skirts and end seals are acceptable. When using steel or ductile iron casing, design consideration for corrosion protection should be considered. Encasement shall extend a minimum of 10- feet on each side of the crossing. One full stick of sewer pipe shall be centered at the point of crossing so that the joints will be equidistant and as far as possible from the water line. The sewer pipe shall be the longest standard length available from the manufacturer.
- B. Check for crossing or parallel utilities. Maintain minimum vertical and horizontal clearances. Avoid crossing at highly acute angles (smallest angle measure between utilities should be 45 degrees).
- C. At points where thrust blocking is required, minimum clearance between the concrete blocking and other buried utilities or structures shall be 5 feet.
- D. Horizontal clearances from watermain:
- | | |
|-----------------------|--------|
| Cable TV | 5 feet |
| Natural gas | 5 feet |
| Power | 5 feet |
| Storm | 5 feet |
| Telephone/fiber optic | 5 feet |
- E. Vertical clearances from watermain:
- | | |
|-------------|--------|
| Cable TV | 1 foot |
| Natural gas | 1 foot |
| Power | 1 foot |
| Storm | 1 foot |

Telephone/fiber optic 1 foot

- F. The developer/contractor is responsible for sending a letter and preliminary plan to existing utilities to inform them of new construction and requesting as-built information for incorporation into plans. At a minimum the following utilities shall be contacted:
- Cable television
 - Natural gas
 - Power
 - Telephone/fiber optic

5.07 Slopes

- A. Vertical bends shall be used when joint deflection would exceed 5 degrees.
- B. All pipe joints shall be restrained where slopes are 20% or greater. Anchors shall be used in conjunction with joint restraint where slopes are 25% or greater.

5.08 Connections to Existing System

- A. When tapping water mains, use stainless steel full booted tees conforming to 18-8 Type 304 stainless steel with a CF 8 cast stainless steel flanged end with ANSI 150 lb drilling. Bolts and hardware shall be Type 304 stainless steel.
- B. Connections to existing mains 8-inch diameter and larger shall be via a wet tap unless otherwise approved by the City.
- C. Connections to existing mains smaller than 8-inches in diameter shall be by cutting in a tee, unless otherwise approved by the City Engineer.
- D. Size on size tapping tees are not allowed unless otherwise approved by the City Engineer.

5.09 Easements

- A. Show all utility easements and identify width. If easement is defined as a constant width on each side of watermain, then show a segment of the easement and label as typical (typ).
- B. All easements shall be a minimum of 15 foot in width, except as noted in 4.05(D), unless otherwise approved or required by the City Engineer.

5.10 Services

- A. Locate water services and indicate size. Sizes shall be determined by the developer and approved by the City Engineer.
- B. For offices, multi-family developments and plats with planter areas, provide irrigation services. Irrigation shall be by separate water main connection and service unless approved by the City Engineer. Deduct meters may be allowed for commercial/industrial development.
- C. Static service pressures at ground floor elevation shall be determined at all lots/buildings to ensure compliance with system pressure standards.
- D. Identify lots/buildings where pressure reducing valves are required. Individual service PRVs shall be placed on the customer side of service lines (after water meter box) when service pressures exceed 80 psi.
- E. Meter boxes shall be located within the right-of-way inside the corresponding property lines for the lot being served and outside of hard surfaces where practical. Where no other option exists and meter box has to be installed in a paved surface, a Design Modification request per

Section 1.17 shall be sent to City for review and approval and traffic bearing lids are required.

5.11 Backflow Prevention

- A. Private fire protection systems, irrigation systems and special domestic services shall comply with minimum backflow requirements as outlined in the following charts.
- B. Installation shall comply with the City of Stevenson requirements and Washington State Department of Health regulations.
- C. A minimum of a double check valve assembly shall be installed behind the water meter. Service pipe and backflow devices installed after the water meter are considered private and the responsibility of the property owner to maintain.
- D. Food carts shall include a reduced pressure backflow assembly after water meter connections and prior to connection to the unit.
- E. All private fire systems, including double check valve assemblies from the mainline control gate valve, shall be owned and maintained by the property owner.
- F. All backflow assemblies for domestic water service lines shall be installed in vaults outside of building as close as possible to supplying main. All backflow assemblies for fire supply lines shall be installed inside of the sprinkled structure.
- G. Fire systems in existing buildings being revised or upgraded shall comply with current regulations.
- H. Special "health hazard" facilities (facilities named in cross-connection control W.A.C. 248-54-285) such as hospitals, morgues, wastewater plants, metal plating facilities, laboratories, and food beverage plants, are required to have backflow prevention devices as noted.

Private Fire Lines and Fire Sprinkler System Chart

	Double Check Valve Assembly	Double Check Valve Assembly with Detector	Reduced Pressure Backflow Assembly	Reduced Pressure Backflow Assembly with Detector
Fire system without chemical addition - 3-inch & larger		X		
Fire system without chemical addition - 3/4-inch to 2-1/2-inch	X			
Fire system with chemical addition				X
Private fire system with hydrants		X		

Notes:

1. All backflow prevention assemblies require test and inspection at the time of installation and annual test thereafter.
2. Backflow assemblies shall be installed per the standards details.

Irrigation and Domestic Service Backflow Protection Chart

	Double Check Valve Assembly	Reduced Pressure Backflow Assembly	Double Check Valve Assembly and bypass
Irrigation system - (without chemical injection)	X		
Irrigation systems - (with chemical injection)		X	
Tall buildings - over 30 feet above ground level <u>or</u> with in-line booster pump interrupted service permissible	X		
Tall building - over 30 feet above ground level <u>or</u> with in-line booster pump uninterrupted service required			X
Facilities with health hazards, i.e., hospitals, laboratories, sewage lift stations, car washes etc.**		X	

Notes:

1. All backflow prevention assemblies require test and inspection at the time of installation and annually test thereafter.
2. Backflow assemblies shall be installed per the standards details.
3. If service is uninterruptable, then bypass with RPBD is required.

5.12 Satellite (Remote) Water Systems

- I. Applicability. It is the City's policy to require all customers to be served by direct extension of water mains from the City's water system. Where satellite (remote) water systems are authorized by the City, they shall be designed per these standards.
- J. Well and Well Pump
 - 1) Two wells required, each of equal size, depth, and equipment.
 - 2) 8-inch minimum diameter casing.

- 3) Stainless steel screen.
- 4) 480 Volt 3-phase well pump.

K. Well Pump Building

- 1) Each well located in a well pump building having a minimum of 5-feet clear distance between well and building walls with access provided for well maintenance.
- 2) One of the pump buildings shall have an emergency generator with automatic starter, and two days of fuel supply at full load.
- 3) Removable roof on building.
- 4) Architectural features as follows:
 - a. Coated metal roof.
 - b. Split-face CMU walls.
 - c. Two metal doors with panic hardware.
 - d. Separate room for emergency generator.
 - e. A thermostat operated heater.
 - f. Automatic ventilation.
- 5) Controls to include radio or phone telemetry.
- 6) Water treatment as necessary to meet all drinking water standards and chlorine disinfection.

L. Distribution System

- 1) Ductile iron pipe with design and construction per City's standards.

5.13 Reclaimed Water Systems

All reclaimed water systems shall meet applicable State standards for the distribution and use of reclaimed water. Where reclaimed water is available for use, the City may require that this water source be given preference as a substitute for non-potable water or irrigation use. Where reclaimed water systems are authorized, they shall be designed per Washington State Department of Ecology standards.