

Chapter 5

Drinking Water

City of Kelso
Engineering Design Manual
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 Engineering Design Manual

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CHAPTER 5 – DRINKING WATER

5.010 General

Any extension, modification of, or connection to, the water system must be approved by the City, and design must conform to the requirements and standards of the Department of Health, the most current version of the Kelso Water System Plan, the KEDM and AWWA. Applicant shall pay the cost for any Water System Plan amendments required by the Washington State Department of Health, or City Engineer.

All proposed water main extensions shall comply with the City's requirements for development, water quality and pressure zones, and fire protection. It is the Applicant's responsibility to determine that adequate water for both domestic use and fire protection is attainable. The Applicant must show in the proposed plans how water will be supplied and whether adequate water volumes at acceptable pressure and velocity will be attained in case of fire. A hydraulic analysis of the system may be required if it appears that the system might be inadequate. A meeting with the City Engineer will be required prior to completion of the hydraulic analysis to help determine minimum requirements for the report. When directed by the City Engineer, the Applicant's Engineer shall provide a "pressure available" chart on the water system plan sheet of the construction plans. This sheet shall indicate the calculated pressures theoretically available to each lot during static and peak demand periods based upon an analysis of the system.

Anyone who wishes to extend or connect to the City's water system may contact the City for an estimate of water extension/connection fees. All fees and charges related to development will be in accordance with the latest requirements of the KMC.

Prior to issuing building permits and the setting of any water meters, all public improvements for the development must be completed and approved, right-of-way or easements conveyed to the City, as-built record drawings submitted and approved and all applicable fees paid.

Building permits will not be issued for any project until the required fire protection facilities, minimum required fire flows and emergency access, meeting the International Fire Code Requirements are completed and accepted.

5.020 Main Line

A. Sizing. All water mains shall be sized according to the most recent Water System Plan. The minimum water main size shall be 6 inches in diameter where looped. Larger-sized mains are required for dead-end lines and in specific areas outlined in the current Water System Plan. Nothing will preclude the City from requiring the installation of a larger-sized main than shown in the Water System Plan if the City determines a larger size is needed to meet fire protection and domestic requirements or for future service.

B. Blow-offs for Dead End Lines. Dead-end mains, when permitted, shall be 8 inches in diameter to the final hydrant. A blow off assembly will be required at the end of the line unless terminated at a hydrant.

C. No Additional Service Allowed on Two (2) Inch Mains. Additional units may not connect to existing 2-inch diameter lines.

D. All water main and fire service connection pipe shall be cement mortar-lined ductile iron pipe conforming to AWWA C151 Class 50, or HDPE pipe meeting the requirements of AWWA Class 200, C901, and C906. Cement mortar lining shall meet the requirements of AWWA C104. Non-restrained joints shall be rubber gasketed, push-on type or mechanical joint, conforming to AWWA C111.

E. Water mains shall be extended through and to the extremes of the development. Looping may be required to meet fire flow requirements or provisions of the most current Water System Plan. All water mains that may be extended or looped shall end with an approved gate valve and MJ plug.

F. Water mains shall be designed so that flow velocities do not exceed 7 feet per second during any flow condition to reduce the chance of water hammer. Pressures of not less than thirty (30) psi or greater than ninety (90) psi shall be maintained in the main during peak demands.

H. Rights-of-way or easements within the Development site shall be conveyed to the City for access and maintenance of all water systems, and other related facilities which will be maintained by the City. The minimum widths of rights-of-way or easements shall be as follows, although the City Engineer may require increased widths when necessary to insure adequate area for equipment access and maintenance:

1. All easements for water mains shall be a minimum of twenty (20) feet wide for pipes less than 10 feet deep.
2. For pipes ten feet deep and greater, the width of easements shall be equal to or greater than the numerical value of twice the depth of the pipe invert measured from finish grade plus the outside bell diameter of the pipe, but not less than 20 feet.
3. Pipes shall be centered within the right-of-way or easement;
4. Easements for lift stations, vaults or other facilities shall be dimensioned as directed by the Director.

No buildings or other structures that prevent access are permitted within rights-of-way or easements. Gates of sufficient width to provide access by maintenance vehicles shall be provided in fences crossing rights-of-way, but not less than twelve (12) feet wide.

When possible, easements for apartment complexes or commercial/industrial developments shall be in parking lots, private drives, or similar areas that allow unobstructed vehicle access for maintenance.

I. Within easements outside of City ROW, at each bend in the water main a bend marker shall be placed indicating the angle of the bend and direction of the water main each way. Bend marker posts shall be 4-inch Carsonite CWV-116 posts stamped with "Caution Water Main."

5.025 Required Separation Between Water Lines and Sanitary Sewers

- A. Horizontal and vertical separation (parallel). A minimum horizontal separation of 10 feet between sanitary sewers and any existing potable water line and a minimum vertical separation of 18 inches between the bottom of the water line and the crown of the sewer shall be maintained. The distance shall be measured edge to edge. See Figure 6-1 below.
- B. Unusual conditions (parallel). When local conditions prevent the separations described above, a sewer may be laid closer than 10 feet horizontally or 18 inches vertically to a water line provided:
1. It is laid in a separate trench from the water line.
 2. The elevation of the crown of the sewer line must be at least 18 inches below the bottom of the water line. When this vertical separation cannot be obtained, the sewer shall be constructed of materials and joints that are equivalent to water main standards of construction and shall be pressure tested to ensure water-tightness prior to backfilling. Adequate restraint should be provided to allow testing to occur.
 3. If sewers must be located in the same trench as a potable water line, special construction and mitigation is required. Both water lines and sewer lines shall be constructed with pressure-rated pipe material designed to withstand a minimum static pressure of 150 psi. The water line shall be placed on a bench of undisturbed earth with the bottom of the water pipe at least 18 inches above the crown of the sewer and shall have at least 5 feet of horizontal separation at all times.

Figure 5-1
Required Separation Between Water Lines and Sanitary Sewers, Parallel Construction

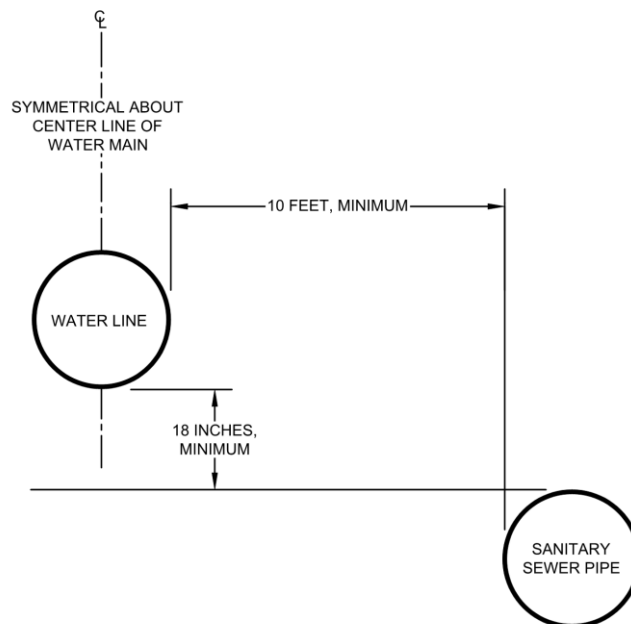
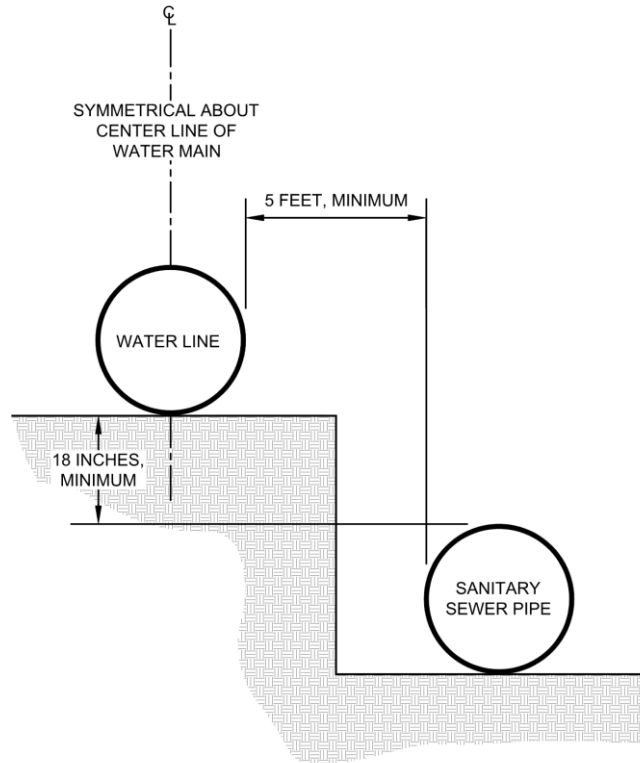


Figure 5-2

**Required Separation Between Water Lines and Sanitary Sewers, Unusual Conditions
Parallel Construction**



C. Vertical separation (perpendicular). Sewer lines crossing water lines shall be laid below the water lines to provide a separation of at least 18 inches between the invert of the water line and the crown of the sewer.

D. Unusual conditions (perpendicular). When local conditions prevent a vertical separation as described above, construction shall be used as follows:

1. Gravity sewers constructed to pass over or under water lines. These gravity sewers shall be:
 - a. Constructed of material described in Table 1.
 - b. The maximum standard length of pipe available from the manufacturer (but not less than 18 feet long) shall be used, with the pipes centered at the point of crossing to maximize joint separation.

Table 1: Water Main Standard Pipe Material

Type of Pipe	AWWA (ASTM) Standard		
	Pipe	Joint	Fittings
Ductile Iron	C 151 and C 104	C 111	C 110
HDPE 3408	C901 and C 906	Fused per C901 and C 906	C901 and C 906
PVC	C900 and C905	Per AWWA	Per AWWA

2. Water lines constructed to pass under gravity sewers. Water lines 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.
 - b. Adequate structural support for the sewers to prevent excessive deflection of joints and settling on and breaking of the water lines.
 - c. The sewer shall be constructed of the material described in Table 1. The length 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. A water line casing equivalent to that specified above in D(1) above.

5.030 Service Interruption

The Contractor shall make every effort to schedule water main construction with a minimum interruption of water service. In all situations, the City will dictate scheduling of water main shutdowns so as not to impose unnecessary shutdowns during specific periods to existing customers.

Following approval of the proposed schedule for water main shutdown, and at least four (4) business days prior to the shutdown, the Contractor shall give written notice to the City. In addition, the Contractor shall provide written notice to affected customers at least 48-hours prior to the shutdown. Written notice to affected customers shall consist of, at a minimum, door hangers, as well as signs posted at the entrance to the customer’s streets of the impacted area.

5.040 Valves

Valves shall be installed in the distribution system at sufficient intervals to facilitate system repair and maintenance, but in no case will there be less than one valve every 600 feet. Three (3) valves shall be installed on all tees and 4 valves on all crosses in each intersection. Specific requirements for valve spacing will be made at the plan review stage.

- A. Valves 8-inches and smaller shall be resilient seat gate valves, NRS (Non-Rising Stem), with O-ring seals. Valve ends shall be mechanical joint or ANSI flanges. Valves will conform to AWWA 509-80 or AWWA C-515. System gate valves will be M&H, Kennedy, AVK, Mueller, or Clow.

B. Valves greater than 8-inches shall be butterfly valves. Butterfly valves shall conform to AWWA C504-87, Class 150B, with cast iron short body and O-ring stem seals. Butterfly valves shall be Mueller, M&H, Clow, Kennedy, or American Flow.

5.050 Air and Vacuum Release Valve

Air/Vac valve installation shall be set at the high point of the line, when required. Where possible, pipes shall be graded to prevent the need for an air release valve. All Air-Vac, Air Evacuation, and Vacuum Prevention Valves of sizes two (2) inches and larger shall vent to the outside of the vault.

5.060 Blowoff Assembly

If a fire hydrant is not located at the end of a dead-end main, a blowoff assembly will be required. On water mains that will be extended in the future, the valve that operates the blowoff assembly shall be the same size as the main and provided with a concrete thrust block.

5.070 Meters and Service Connections

A. Water meters sized up to 2-inches shall be furnished and set by the City and installed by the Applicant.

B. Meters larger than 2-inches will be furnished by the City and installed by the Applicant. The cost of the meters shall be reimbursed to the City by the Applicant.

C. Water meters may be set only after the Applicant completes the following:

- Installs the water service connection and it has been inspected and approved.
- Installs a sanitary sewer or septic system and it has been inspected and approved.
- Has completed a water use questionnaire.
- Has paid all fees.

D. All meters are the property of the City.

E. Meters located within county right-of-way shall be placed within two (2) feet of the property line.

F. Installation of a State certified backflow device and final acceptance of the water system by the City shall be completed prior to installation of irrigation meters.

G. The City will not accept a water system until all the requirements of the Extension Agreement have been completed and all the fees have been paid.

H. Water services shall be single runs from the main line to each meter. Manifolds with multiple meters shall be allowed in multi-family units with a single property owner or on commercial/industrial sites with a single owner as approved by the City Engineer.

5.080 Pressure Reducing Valve

A pressure-reducing valve (PRV) is required on the customer's side of the meter for all water services that have a static water pressure above 80 psi. PRV's shall be installed in a vault (see

Standard Plan) adjacent to and outside of the meter box. All PRVs shall be owned and maintained by the property owner.

5.090 Hydrants

A. The number and locations of fire hydrants and fire flow requirements shall comply with the requirements of the International Fire Code Appendix C. Plans showing fire hydrant locations and available fire flows shall be provided by the Applicant and will be reviewed by Cowlitz 2 Fire & Rescue. The Fire Marshall may require additional hydrants per International Fire Code (IFC) requirements.

B. When a fire department connection (FDC) is installed in conjunction with an automatic sprinkler system, a fire hydrant shall be located within fifty (50) feet of the FDC.

C. Fire hydrants shall not be connected to mains less than 8-inch diameter. Connection of a fire hydrant to a dead-end line is allowed only for lines less than 300 feet long. Applicant shall provide verification of available fire flow capacity for dead end hydrant locations.

D. Fire hydrants shall be located to allow a 5-foot clear space surrounding the hydrant, and where no obstructions are directly in line with any of the ports.

E. The lateral line from the main to the fire hydrant shall be a maximum of 50 feet in length.

F. The size, and location of fire department connections (FDC) and/or post indicator valves will be determined by the Building Official and the Fire Department. The location of the FDC shall be shown on the water plans for the development.

G. Protection may be required for fire hydrants, per the requirements of IFC, determined to be proposed in vulnerable locations.

H. Fire hydrants shall be installed, tested, and accepted prior to the issuance of a building permit.

5.100 Fire Services

A. No more than one (1) structure shall be served by any one (1) fire service.

B. Fire service lines shall be ductile iron.

C. Fire service line plans shall be submitted to the City for approval prior to construction. A Record Drawing for the fire service line shall be submitted prior to issuance of the Certificate of Occupancy for the building.

D. Double Check Detector Assemblies shall be installed on all fire services where hydrants are installed.

E. Fire Service Double Check Detector Assemblies shall be installed at the property line or edge of the public water line easement.

F. Fire services shall be metered at the expense of the Owner. Water meters for Double Check

Detector Assemblies shall be the size and type approved by the City. The meter on the bypass detector shall read in cubic feet.

G. Fire Line Flow and Tamper Switches installed, as required by UBC sec. 3803, shall be connected to a monitored Fire Detection System approved by the Fire Marshal. The tamper switches are required on the rising stem gate valves in the vault, as well as any other indicating control valves on the fire protection system. Electrical inspection and permit are required.

H. The remote reader (if allowed) shall be rigidly mounted on an exterior building wall (near the domestic meter), enclosed in a metal box with a slot opening which allows reading the remote without opening the box, and at an elevation of five (5) feet above the finish grade level.

The remote reader shall have the same number configuration as the metering device itself, and read in cubic feet. All wires to the remote reader shall be enclosed in a heavy plastic or rigid metal conduit. All wiring shall be in conformance with appropriate sections of the National Electric Code.

The City shall maintain the portion of the fire service line up to the wall of the Double Check Detector Assembly vault. The property owner shall own and maintain the fire service line beyond this point.

5.110 Vaults

To ensure proper operation and accessibility of all assemblies within vaults, the following requirements shall apply to the vaults and installation of these assemblies.

A. The vault shall be sealed with an asphalt base foundation coating on the outside of the vault. Vault penetrations shall be sealed with non-shrink grout from the outside. Apply waterproof coating over grout. Backfill around vault per the manufacturer's specifications.

B. Access to the vault shall be provided by an H-20 rated hydraulic assist locking hatch with a minimum size of 36" x 60" locking open at 90°. The hatch shall be leak proof, gasketed, double raised and made of aluminum.

C. Provide an approved ladder if the vault or chamber depth is 5'0" or greater and entry is through the vault or chamber roof. Ladders shall include a Model 1 Bilco LadderUP safety post or approved equal.

D. Adequate drainage for the vault or chamber shall be provided. (Drainage to piped storm systems allowed with check valve).

E. Vaults shall be equipped with a moisture proof light fixture if adequate lighting is not available.

F. Vaults shall have no other use, except for the use described by these Standards.

G. The vault shall be installed on undisturbed base or compacted 5/8"-0" crushed rock base.

- H. No piping shall be installed in excess of three (3) feet above the vault floor.
- I. The assembly shall be adequately supported from the floor, and suitably restrained from movement. Supports shall consist of steel supports or approved equal; no wood supports shall be used.
- J. All electrical wiring shall be inspected by the Washington State Electrical Inspector (Permit is required).
- K. The assembly shall be readily accessible with adequate room for maintenance.

5.120 Cross Connection Control and Backflow Prevention Assemblies

All water system connections to serve buildings or properties with domestic water, fire sprinkler systems, or irrigation systems shall comply with the minimum backflow prevention requirements as established by the Department of Health (DOH), WAC 246-290-490, and the City.

Backflow prevention devices shall comply with and be installed in accordance with the requirements of the current Washington State Department of Health regulations, AWWA manual "Backflow Prevention and Cross-Connection Control Recommended Practices" (published 2015), and the current version of the International Plumbing Code.

An approved backflow prevention assembly, as listed in "Backflow Prevention Assemblies for Installation in Washington State" (DOH PUB 331-137), is required on all fire service line systems, domestic water services larger than 2-inches, and/or buildings in excess of thirty (30) feet above the water main. The assembly shall be installed at the location normally established for water meters, usually at the property line. A water service shall not be turned on until all required backflow prevention assemblies are installed, inspected, tested, approved, and registered with the City of Kelso. The backflow prevention assembly will remain the property of the customer. The Applicant will be responsible for all maintenance and testing of the assembly and vault for the life of the assembly.

The type of backflow prevention assembly required is based on the type of premises to which water service is being provided. The approved types of assemblies are listed below with some of the types of premises that must be protected by each type of assembly. However, these lists are not complete, they are only intended to provide some basic guidelines.

A. Reduced Pressure Backflow Prevention Assembly

An approved Reduced Pressure Backflow Prevention Assembly shall be installed on the service connection above ground to the following:

1. Any parcel or structure that has an auxiliary water supply on or available to it. This will include any above or below ground water source. (The most commonly encountered type of auxiliary water supply is a private well);

2. Structures which are located within an industrial zone;
3. Hospitals, medical centers, and clinics;
4. Mortuaries and nursing homes;
5. Gas stations;
6. Car washes;
7. Sewage pump and lift stations;
8. Dry cleaners and commercial laundries;
9. Any water system which has a pump to supplement pressure; and
10. Irrigation systems, which are designed to use chemical injection.

B. Double Check Assembly or Double Check Detector Assembly

An approved double check assembly or an approved double check detector assembly shall be required (provided that all internal plumbing is installed and maintained in accordance with the International Plumbing Code), on the service connection to structures where there is:

1. Any fire system or water line to a private fire hydrant (Double Check Detector Assembly required);
2. Multi-story buildings which are in excess of thirty (30) feet above the water main at the service connection;
3. Shopping centers or large retail stores; and
4. Restaurants or fast food establishments.

C. Installation and Testing

Backflow vaults shall be located on private property and outside of public easements

Backflow prevention assemblies shall be installed at the water service connection on the customer side of the meter.

No part of the backflow prevention assembly shall be submerged in water or installed in a location subject to flooding. In a vault or chamber, adequate drainage shall be provided; and test cocks shall be plugged. The plugs shall not be of dissimilar metals.

The backflow assembly shall be protected from freezing and other severe weather conditions.

All backflow assemblies shall have a minimum twelve (12) inch clearance on the back side, twenty-four (24) inch clearance on the test-cock side and twelve (12) inch clearance below the assembly.

A clearance of at least six (6) inches shall be maintained above the gate-valve stem at full extension. A minimum headroom of six (6) feet is required in vaults without a full opening top. Access to the device and to any vault or chamber shall remain clear at all times.

After installation, all backflow prevention assemblies shall be tested by a State of Washington certified tester. The results of the testing shall be submitted to and approved by the City prior to issuance of "final occupancy."

Appendix 1: Standard Plans

Standard Plan Index

Title	Standard Plan No.
Standard Water Plans	
¾” and 1” Water Service Connection	KW-010-21
Double Service Connection – 1” Residential	KW-020-21
1 ½” and 2” Water Service	KW-030-21
2” Irrigation Water Service	KW-040-21
3” and Larger, Above Ground, Water Meter Assembly and Vault	KW-050-21
3” and Larger, Below Ground, Water Meter Assembly and Vault	KW-060-21
4” – 12” Typical Pressure Regulation Station	KW-070-21
Hydrant Assembly	KW-080-21
2” Blowoff Assembly	KW-090-21
1” Manual Air Release Assembly	KW-100-21
2” Air/Vacuum Release Valve	KW-110-21
Valve Box Assembly	KW-120-21
Connection to Existing Water Main	KW-130-21
Double Check Valve Assembly – 2” and Smaller	KW-140-21
Concrete Thrust Block	WSDOT B-90.40-01
Supplemental to WSDOT B-90.40-01	
Concrete Thrust Block For Convex Vertical Bends	WSDOT B-90.50-00
Supplemental to WSDOT B-90.50-00	