

CITY OF VERNONIA PUBLIC WORKS DESIGN STANDARDS

SECTION 5.0000 - WATER MAINS

5.0010 - GENERAL DESIGN REQUIREMENTS

Performance Standards - Water distribution systems shall be designed to meet State Water Administrative Rules and guidelines of the Water System Master Plan and its updates.

Water system design shall provide adequate flow for fire protection and maximum water usage and consumption. Required water system demands shall be met by maintaining the minimum operating pressures required by the City. For single family residential areas the minimum static pressure shall be 40 psi, and the minimum fire flow shall be 1000 gpm. For all other developments, the required fire flow shall be as determined by the Fire Chief.

Water system design shall meet distribution needs for maximum water usage and consumption within a given service area. New water systems shall be extended to the far side of the property to allow for future extensions beyond present development and to be consistent with the Master Plan.

All water lines shall be located within the public right-of-way or as directed by the City Engineer. These lines are placed in the public right-of-way for ease of maintenance and access, control of the facility, operation of the facility, and to permit required replacement and/or repair. The City Engineer, under special conditions, may allow a public water line to be located within a public water easement as referenced in Section 5.0024.

Where water lines are constructed on slopes greater than 20%, in areas designated as hazardous or where there are site conditions that may cause damage to improvements, slippage or slides as determined by the City Engineer, a soils and/or geologic report may be required.

Where the finished graded surface is greater than twenty percent (20%), or as required by the City Engineer, soil stabilization fabric shall be placed over the entire disturbed area.

Standard specifications and drawings relevant to this section may be found in the most current edition of the APWA Standard Specification for Public Works Construction, Oregon Chapter.

5.0011 - PIPE MATERIALS AND SIZE

All public water distribution systems may be constructed with ductile iron pipe, minimum thickness as shown in the following table.

Pipe size (inches)	D.I. Class
8 and smaller	52
10	51
12	50

All such pipes shall be cement mortar-lined pipe with push-on or mechanical type joints. When a corrosive potential condition is encountered, all ductile iron pipe and fittings will be polyethylene encased with a 8 mil tubing meeting manufacturer and AWWA standards. Where an active cathodic protection system is encountered as a result of other utilities, a deviation from the normal pipe design material/installation practice may be required by the City Engineer.

All pipe shall be pressure rated for 150 psi and all valves and fittings shall be pressure rated at 350 psi for ductile iron. All fittings shall be factory cement lined and coated. Pipe constructed per Section 5.0025 will require the use of restrained pipe joints or ball and socket river pipe.

Service lines shall be as shown in the following table.

Service Pipe Size (inches)	Pipe Material
1 1/2 and Smaller	Type K Copper Tubing
2	Polyethylene
3 and Larger	Ductile Iron

Water distribution main sizes shall conform to the following:

- 4-inch A looped water main utilized in residential streets on dead-end streets (cul-de-sac) less than 450 feet in length measured from the center of the street intersection and the radius point of the cul-de-sac of the dead-end street. No more than twelve (12) 3/4 residential services will be served off this facility. The actual number of services will be based on actual flow and pressure available. Fire hydrants are not permitted on four (4) inch lines.
- 4-inch Non-looped water mains may only be used with approval of the City Engineer residential zones on dead-end streets less than a center line distance of 250 feet measured from the center of the intersection street to the radius point of the cul-de-sac of a dead-end street with service to not more than 12 residences and shall be connected to a looped minimum six-inch main. Fire hydrants are not permitted on four-inch lines. All dead end four-inch lines shall terminate with a standard two inch (2") blow off.
- 6-inch Minimum size residential subdivision distribution water main for the grid (looped) system and for fire protection, not to exceed an unsupported length of 600 feet and shall not be permanently dead-ended. Looping of the distribution grid shall be at least every 600 feet.
- 8-inch Minimum size for permanently dead-ended mains supplying fire hydrants with a fire flow less than 1,500 gpm and for primary feeder mains in residential subdivisions.
- 10-inch & up As required for primary feeder lines in subdivisions, industrial and commercial areas.

Water service lines shall conform to the following:

- 3/4" Residential services.
- 1" and up Public, Commercial, Industrial and other non-residential uses shall be sized per actual usage.

Velocity in distribution mains shall be designed not to exceed five feet (5') per second. Velocity in service lines (as defined in Section: 5.0050) shall not exceed ten feet (10') per second.

5.0012 - GRID SYSTEM

The distribution system mains shall be looped at all possible locations. All developments will be required to extend mains across existing or proposed streets for future extensions by the City or other developments. All terminations shall be planned and located such that new or existing pavement will not have to be cut in the future when the main is extended. The installation of permanent dead-end mains greater than 250 feet upon which fire protection depends and the dependence of relatively large areas on single mains will not be permitted.

5.0013 - DEAD-END MAINS

Dead-end mains which will be extended in the future shall be provided with a line-size gate valve and MJ plug at the end and tie rodded. The valve plug shall be tapped 2" and provided with a standard blow-off, except that the 2" gate valve shall not be installed.

Permanent dead-end mains shall terminate with a standard blow-off assembly.

5.0020 - ALIGNMENT AND COVER

5.0021 - RIGHT-OF-WAY LOCATION

Water systems shall be located twelve feet (12') south and east from the right-of-way centerline or as directed by the City Engineer. Except as provided in Section 5.0024, all water lines shall be in the public right-of-way. All abrupt changes in vertical or horizontal alignment shall be made with a concrete thrust block or a megaluug or MJ grip ring as required by the City Engineer. Curved alignment for water lines or mains is permitted and shall follow the street centerline when practical. The minimum allowed radius shall be based on allowable pipe deflection for the pipe diameter and the pipe laying length but not to exceed 3° joint deflection.

5.0022 - MINIMUM COVER

The standard minimum cover over buried water mains within the street right-of-way or easements shall be thirty-six inches (36") from finish grade.

Finish grade shall normally mean the proposed pavement or ground elevation where the main is located.

Deviation from the above standards will be considered on a case-by-case basis when the following exists:

- a. When there is underlying rock strata that prohibits placement of the water main thirty-six inches (36") below finish grade, a written request must be submitted to the City Engineer together with submission of a soils report with a plan and profile certifying that bed rock exists less than three feet (3') below the undisturbed ground surface.

5.0023 - SEPARATION WITH SEWER LINES

Water mains shall be installed a minimum clear distance of ten feet (10') horizontally from sanitary sewers and shall be installed to go over the top of such sewers with a minimum of eighteen inches (18") of clearance at intersections of these pipes. Exceptions shall first be approved by the City Engineer. In all instances, the distances shall be measured edge to edge. The minimum spacing between water mains and storm drains, gas lines, and other underground utilities, excepting sanitary sewers, shall be three feet (3') horizontally when the standard utility location cannot be maintained.

Where water lines are being designed for installation parallel with the other water mains, utility pipe, or conduit lines, the vertical separation shall be twelve inches (12") below or in such a manner which will permit future side connections of mains, hydrants, or services and avoid conflicts with parallel utilities without abrupt changes in vertical grade of the above mentioned main, hydrant, or service. Where crossing of utilities are required, the minimum vertical clearance shall be six inches (6").

5.0024 - EASEMENTS

Mains placed in easements along a property line shall have easements centered on the property line and shall be offset eighteen inches (18") from the property line. For mains placed in easements located other than along a property line, the main shall be placed in the center of the easement. Easements, when required, shall be exclusive and a minimum of fifteen feet (15') in width. The conditions of the easement shall be such that the easement shall not be used for any purpose which would interfere with the unrestricted use for water main purposes. Under no circumstances shall a building or structure be placed over a water main or water main easement. This includes overhanging structures with footings located outside the easement. Further, no trees or large bushes shall be planted in the easement.

Easement locations for public mains serving a PUD, apartment complex, or commercial/industrial development shall be in parking lots, private drives, or similar open areas which will permit unobstructed vehicle access for maintenance by City personnel.

Any water main placed within a water main easement will be permanently marked with steel posts and metal signs at all angle points and no less than every 100 feet. In addition, such posts and signs shall be placed where the water line intersects the public right-of-way at the easement location. A monument cap set in the pavement of parking lots shall be an acceptable alternative to the sign. The City shall provide wording for the sign/monument.

All easements must be furnished to the City for review and approval prior to recording.

5.0025 - RELATION TO WATERCOURSES

New water mains may cross over or under existing streams, ponds, rivers, or other bodies of water.

- a. Above Water Crossings - The pipe shall be engineered to provide support, anchorage, and protection from freezing and damage, yet shall remain accessible for repair and maintenance. All above water crossings will require review and approval by the Superintendent of Public Works.
 1. Valves shall be provided at each end.
 2. Air/Vacuum relief valves shall be provided.
- b. Underwater Crossings
 1. Mains crossing stream or drainage channels shall be designed to cross as nearly perpendicular to the channel as possible.
 2. Valves shall be provided at both ends of the water crossing so that the section can be isolated for testing or repair. The valves shall be easily accessible and not subject to flooding. The valve nearest to the supply source shall be in a manhole. Permanent taps shall be made on each side of the valve within the manhole to allow insertion of a small meter for testing to determine leakage and for sampling.
 3. The minimum cover from the bottom of the stream bed or drainage channel to the top of pipe shall be thirty-six inches (36").
 4. A scour pad centered on the water line will be required for the top of the pipe to the bottom of the stream bed or drainage channel is thirty inches (30") or less. The scour pad shall be concrete, six inches (6") thick and six feet (6') wide, reinforced with number four bars twelve inches (12") on center both ways and shall extend to a point where a one-to-one slope, that begins at the top of the bank and slopes down from the bank away from channel centerline intersects the top of the pipe.
- c. The following surface water crossings will be treated on a case-by-case basis:
 1. Stream or drainage channel crossing for pipes twelve inches (12") inside diameter and greater.
 2. River or creek crossings requiring special approval from the Division of State Lands.

5.0030 - APPURTENANCES

5.0031 - VALVES

In general, valves shall be the same size as the mains in which they are installed.

Main line valves shall be resilient seated gate valves meeting the requirements of AWWA C509.

Distribution system valves shall be located at all tee or cross fitting. There shall be a sufficient number of valves so located that not more than four (4) and preferably three (3) valves must be operated to effect any one particular shutdown. The spacing of valves shall be such that the length of any one shutdown in commercial or industrial areas shall not exceed 500 feet nor 800 feet in other areas.

In general, a tee-intersection shall be valved on all branches and a cross-intersection shall be valved on all branches. Transmission water mains shall have valves at not more than 1,000-foot spacing. Hazardous crossings, such as creek, railroad and highway crossings, shall be valved on each side.

Distribution tees and crosses with valves for future branch lines on transmission mains may be required at the direction of the City Engineer.

5.0032 - FIRE HYDRANTS

The public fire hydrant system shall be designed to provide up to a maximum of 3,500 GPM. The distribution system shall be designed in commercial/industrial areas to accommodate fire flows up to 4,500 GPM or as required by the Fire Chief. Minimum fire flow in single family residential areas shall be 1500 GPM.

The distribution of hydrants shall be based upon the required average fire flow for the area served. Design coverage shall result in hydrant spacing of approximately 500 feet in residential areas, approximately 300 feet in commercial or industrial subdivisions or as approved by the Fire Chief and City Engineer. In addition, sufficient hydrants shall be available within 1000 feet of a building in commercial/industrial areas to provide its required fire flow.

Residential hydrants shall be located as nearly as possible to the corner of street intersections and not more than 500 feet from any cul-de-sac radius point.

No fire hydrant shall be installed on a main of less than eight inches (8") inside diameter unless it is in a looped system of six-inch (6") mains. The hydrant lead shall be minimum six-inch (6") inside diameter.

All fire hydrants will be located behind the existing or proposed curb. If any public hydrant encroaches on private property an easement will be provided as directed by the City Engineer.

No hydrant shall be installed within five feet (5') of any existing aboveground utility nor shall any utility install facilities closer than five feet (5') from an existing hydrant.

Full-depth hydrants will be required in all installations. Installation of hydrant extensions will require City Engineer approval.

Each fire hydrant shall have an auxiliary valve and valve box which will permit repair of the hydrant without shutting down the main supplying the hydrant. Such auxiliary valves shall be resilient seat gate valves. The auxiliary valve shall have mechanical joint-flange ends. The valve shall be connected directly to the water main using a flange joint tee, tie rods, and thrust blocked.

Hydrants shall not be located within twenty feet (20') of any building, nor will they be blocked by parking. The large hydrant port should face the road or travel way. Hydrant shall have 2 2-1/2" ports and 1 4-1/2" port. All Fire Hydrants provided shall be Clow Medallion, American Hydrants, or equal as approved by the City Engineer.

Guard posts a minimum of three feet (3') high shall be required for protection from vehicles when necessary. Such protection shall consist of four-inch (4") diameter steel pipes six feet (6') long filled with concrete and buried a minimum of three (3') feet deep in concrete and located at the corners of a six (6') foot square with the hydrant located in the center. Use of posts other than at the four corners may be approved by the City Engineer.

5.0033 - PRESSURE-REDUCING AND AIR RELEASE VALVES

The City's water distribution system is divided into several pressure zones. Where water systems cross these zone lines, a pressure-reducing valve station will be required. The specific design and location for such valves will be reviewed and approved by the City Engineer.

When designated by the City Engineer, air release valves shall be installed. Such valves will be required on large diameter lines at all high points in grade.

5.0034 - RAILROAD OR HIGHWAY CROSSINGS

All such crossings defined above, or as determined by the City to be of a hazardous nature, shall be valved on both sides of the crossing. Casing of railroad or highway crossings, if required, shall be as noted in the permit from the respective agency.

5.0035 - ANCHOR BLOCKS

For water pipes greater than four inches (4") in diameter, concrete anchor blocks shall be required if the slopes are greater than twenty percent (20%). Anchor blocks shall key into trench sides. Spacing for anchor blocks is as follows:

SPACING FOR ANCHOR BLOCK FOR ALL SIZE PIPE

SLOPE %	MINIMUM SPACING (FT)
0 - 19.99	NO ANCHOR REQUIRED
20 - 34.99	35
35 - 50.99	25
51 - OR MORE	15 OR SPECIAL DESIGN

5.0036 - WATER BARS

Where the finished graded surface has a slope greater than or equal to 3 units horizontal to 1 unit vertical or as required, water bars shall be installed. The water bars shall be sloped slightly to drain runoff water away from the pipe line alignment. Water bars shall have a maximum spacing of forty feet (40').

5.0040 - BACKFLOW PREVENTION

Back flow prevention devices shall be required on all 1-1/2" and larger water services as provided for in Oregon Administrative Rules, Chapter 333.

5.0050 - WATER SERVICE LINES

The sizes of water service lines which may be used are 3/4", 1", 2", 4", 6", 8", 10", and 12". Water service lines will be reviewed for effects on the distribution system and shall not be greater in size than the distribution main.

For two-inch (2") and greater services, a design drawing must be submitted showing the vault and fitting requirements with the expected flow (normal and maximum daily flow) requirements and proposed usage.

Domestic service lines 3/4" through 2" shall normally extend from the main to behind the curb with a meter setter and meter box located at the termination of the service connection. Meters shall be provided and installed by City at the cost of the developer. Meter boxes are to be provided by the developer. In general, individual service connections shall terminate in front of the property to be served and shall be located two feet (2') on each side of a common property line.

When the service line is 1" or less, a Brooks meter box Series 38-S (C.I.) shall be provided.

Fire Service - There are three categories of private fire services: 1) hydrants, 2) fire sprinkler lines, and 3) combination hydrant and fire sprinkler lines.

The water fire service line shall normally extend from the main to the property line and end with a vault, metering device and valves. A double detector check back flow prevention device installed in a vault shall be required at each property being served.

Fire Vaults - A vault will be required when a development provides fire sprinklers. The vault drawing will be included on construction drawings submitted to the City. The vault shall contain all valves, fittings, meters, and appurtenances required for fire service to the development.

5.0060 - SYSTEM TESTING

All new water systems (lines, valves, hydrants, & services) shall be individually pressure tested, chlorinated and tested for bacteria. All testing shall be performed in accordance with the latest edition of the Oregon Chapter APWA Standard Specifications for public works construction, OAR's and in the presence of a City water department representative.

5.0070 - EROSION CONTROL

Erosion control will be required for all areas disturbed during construction and following construction until permanent protection is established.

Temporary facilities may include silt fences, drain barriers, gravel entries, ditches, surface stabilization or other devices as necessary.

Temporary/permanent hydro-seeding or acceptable seeding and mulching must be provided whenever perennial cover cannot be established on sites which will be exposed after September 1 or prior to June 1.

5.0080 - BOOSTER PUMP STATION

In areas of substandard water pressure, the Developer shall provide a package water booster pump station, Hydronix Series 780 or approved equal. The Developer shall submit calculations supporting the capacity of the pump station to the City Engineer for review and approval. The Developer shall submit drawings for the installation to the City Engineer for review and approval. The pump station shall be equipped with a pressure relief valve to bleed flow back to the lower pressure zone during periods of low demand.