

City of West Linn

Public Works Design Standards

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SECTION FOUR – WATER REQUIREMENTS

4.0000 WATER

4.0010 General Design Requirements

- A. Water distribution systems shall be designed to meet State Water Administrative Rules, AWWA Standards, and guidelines of these City of West Linn Design Standards.
- B. 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 1,000 gpm. For all other developments, the required fire flow shall be as determined by the Fire Chief.
- C. Water system design shall meet distribution needs for maximum water usage and consumption within a given pressure zone. New water systems shall allow for future extensions beyond present development.
- D. When water systems are designed where velocities are greater than 5 fps, special provisions shall be made to protect against displacement by erosion and shock.
- E. All waterlines 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 waterline to be located within a public water easement as referenced in **Subsection 4.0024, Easements**.

4.0011 Pipe Materials and Size

- A. All public water distribution systems shall be constructed with ductile iron pipe. All such pipe 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 an 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.
- B. All pipe, valves and fittings shall be pressure rated for 250 or 350 psi. All fittings shall be factory cement lined and coated. Pipe constructed per **Subsection 4.0025, Relation to Watercourses** will require the use of restrained pipe joints or ball and socket river pipe.
- C. Water distribution main sizes shall generally conform to the following:
 - 1. Four-inch - May only be used with approval of the City Engineer in residential zones on dead-end streets with a center line distance of less than 250 ft. measured from the center of the intersecting street to the radius point of the cul-de-sac; with service to not more than 12 residences; and shall be connected to a looped minimum 6 in. main. Fire hydrants are not permitted on 4 in. lines. All 4 in. lines shall terminate with a standard blow-off (Standard Drawing WL-404A.)
 - 2. Eight-inch - Minimum size residential subdivision distribution water main for the grid (looped) system and dead end mains supplying fire hydrants. Looping of the distribution grid should be at least every 600 ft.
 - 3. Twelve-inch and larger - As required for primary feeder lines in subdivisions, industrial, and larger commercial areas.

4. Velocity in distribution mains shall be designed not to exceed 5 ft. per second. Velocity in service lines (as defined in **Subsection 4.0050, Water Service Lines**) shall not exceed 10 ft. per second. Standard trench section (Standard Drawing WL-200) will be utilized for all water pipe installed.
5. Standard main pipe sizes shall be 4", 8", 12", 20" and 24". Any odd main pipe sizes shall be approved by the City Engineer prior to use.

4.0012 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 of other developments within the City. 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 ft., upon which fire protection depends and the dependence of relatively large areas on single mains, will not be permitted.

4.0013 Dead-End Mains

- A. Dead-end mains which will be extended in the future shall be provided with a properly sized blow-off (see Standard Drawing WL-404A and WL-404B).
- B. Permanent 4" dead-end mains shall terminate with a Standard Blow-Off Assembly (see Standard Drawing WL-404A). All larger mains shall terminate with a fire hydrant.

4.0014 Restrained Joints

- A. Restrained joints shall be required for transmission pipelines which cross unstable land, railroad tracks, freeways, watercourses or other locations which could either result in unusual ground movements or could result in significant damage to property or life should a leak occur. Where tees, elbows – (horizontal or vertical), or significant change in water main alignment exist, the joint shall be properly restrained with and Field Lok® gaskets Megalug® bolts ; the exception shall be fire hydrant laterals that shall be constructed in accordance with Standard Drawing WL-401.
- B. If 22° bend or less, then Field Lok® gaskets shall be installed 18 ft. out from both sides of bend, creating 50 ft. of solid connection of water pipe.
- C. If 45° bend or greater, then Field Lok® gaskets shall be installed 75 ft. out from both sides of bend.
- D. Blow-off assemblies shall have 90 ft. of restrained pipe installed. Four or five Field Lok® gaskets shall be installed in this instance. Field verification by City personnel to determine which number of Field Lok® gaskets is required for installation.
- E. Any water main installation proposed that exceeds 18 in. in diameter shall have the design engineer submit a restraint plan to the City for review prior to construction.

4.0020 Alignment and Cover

4.0021 Right-of-Way Location

- A. Water systems shall be located south and east from the right-of-way centerline or as directed by the Engineer. Generally, the waterline will be located 4 ft. from curblineline or edge of pavement. Except as provided in **Subsection 4.0024, Easements** all waterlines shall be in the public right-of-way. All abrupt changes in vertical or horizontal alignment shall be made with a fitting and a concrete thrust block. (Refer to Standard Drawing WL-406 and WL-407).

- B. Curved alignment for waterlines 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.

4.0022 Minimum Cover

- A. The standard minimum cover over buried water mains within the street right-of-way shall be 36 in. from finish grade.
- B. The minimum cover for mains in easements across private property shall be 48 in. from finish grade.
- C. Finish grade shall normally mean the existing or proposed pavement elevation. Where the main is located in the cut or fill side slope or where mains are located in easements, finish grade shall mean final ground elevation at the water main alignment.

4.0023 Separation with Sewer Lines

- A. Water mains shall be installed a minimum clear distance of 10 ft. horizontally from sanitary sewers, and shall be installed to go over the top of such sewers with a minimum of 18 in. of clearance at intersections of these pipes. When physical conditions render this spacing impossible or impractical, then cast iron water pipe with watertight joints or concrete encasements is required for the sewer line.
- B. Wherever it is necessary for sewer and water lines to cross each other, the crossing should be at an angle of approximately 90° and the sewer shall either be located 18 in. or more below the water line or be constructed of cast iron water pipe with watertight joints for a distance of 9 ft. on both sides of the water line. 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 3 ft. horizontally when the standard utility location cannot be maintained.
- C. Where water mains are being designed for installation parallel with other water mains, utility pipe, or conduit lines, the vertical separation shall be 12 in. 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 6 in.

4.0024 Easements

- A. Mains placed in easements along a property line, shall have easements centered on the property line and shall be offset 18 in. from the property line. Mains placed in easements along a right-of-way line shall be offset a minimum 3 ft. from the right-of-way line and within a minimum 10 ft. wide easement. For mains placed in easements located other than along a property or right-of-way line, the main shall be placed in the center of a minimum 15 ft. exclusive easement.
- B. Easements, when required, shall be exclusive and a minimum of 15 ft. 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.
- C. 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.
- D. Any water main placed within a water main easement shall be marked with permanent posts and metal signs at all angle points and line or sight of joints. In addition, such posts and signs shall be placed where

the waterline 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.

- E. All easements must be furnished to the City Engineer for review and approval prior to recording. Easements shall state that the City will not in any way be responsible for replacing landscaping including any shrubs or trees, fencing, or other structures that may exist or have been placed in the easement.

4.0025 Relation to Watercourses

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

1. Above Water Crossings
 - a. 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 City Engineer.
2. Underwater Crossings
 - a. Mains crossing stream or drainage channels shall be designed to cross as nearly perpendicular to the channel as possible.
 - b. 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.
 - c. The following surface water crossings will be treated on a case-by-case basis:
 - Stream or drainage channel crossing for pipes 12 in. inside diameter and greater.
 - River or creek crossings requiring special approval from the Division of State Lands.
 - d. The minimum cover from the bottom of the stream bed or drainage channel to the top of pipe shall be 36 in.
 - e. A scour pad centered on the waterline will be required for mains less than 12 in. inside diameter when the cover from the top of the pipe to the bottom of the stream bed or drainage channel is 30 in. or less. The scour pad shall be concrete, 6 in. thick over and under the pipe and 6 ft. wide; reinforced with No. 4 bars 12 in. on center both ways; and shall extend to a point where a one-to-one slope begins at the top of the bank and slopes down from the bank away from channel centerline and intersects the top of the pipe.

4.0030 Appurtenances

4.0031 Valves

- A. In general, valves shall be the same size as the mains in which they are installed. Valve types and materials shall conform to the City of West Linn Public Works Standard Construction Specifications.
- B. Distribution system valves shall be located at the tee or cross fitting. There shall be a sufficient number of valves so located that not more than four, and preferably three 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 neither exceed 500 ft. nor 800 ft. in other areas.
- C. Valves shall be installed at each cross, tee, or any tap 2 in. or greater in diameter from the main line. All tees shall have 3 valves; all crosses shall have four valves. Transmission water mains shall have valves at

not more than 1,000 ft. spacings. Hazardous crossings such as creeks, railroad and freeway crossings, shall be valved on each side.

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

4.0032 Fire Hydrants

- A. The public fire hydrant system shall be designed to provide adequate flow as required. The distribution system shall be designed in commercial/industrial areas to accommodate fire flows up to 1,500 gpm. Minimum fire flow in single family residential areas shall be 1,000 gpm.
- B. 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 400 ft. in residential areas, approximately 300 ft. in commercial or industrial subdivisions, or as approved by the Fire Chief and City Engineer. In addition, sufficient hydrants shall be available within 1,000 ft. of a building in commercial/industrial areas to provide its required fire flow.
- C. Residential hydrants shall be located as nearly as possible to the corner of street intersections and not more than 400 ft. from any cul-de-sac radius point.
- D. No fire hydrant shall be installed on a main of less than 8 in. inside diameter unless it is in a looped system of 6 in. mains. The hydrant lead shall be a minimum 6 in. inside diameter.
- E. All fire hydrants will be located behind the existing or proposed sidewalk or in the planter strip. Hydrants shall be placed as to not interfere with driveways and curb ramps. If any public hydrant encroaches on private property, an easement will be provided as directed by the City Engineer.
- F. No hydrant shall be installed within 5 ft. of any existing above-ground utility and there shall not be any utility install facilities closer than 5 ft. from an existing hydrant.
- G. Hydrant installation shall conform to Standard Drawing WL-401. Full-depth hydrants will be required in all installations. Installation of hydrant extensions will not be allowed, unless approved by the City Engineer.
- H. Each fire hydrant shall have an auxiliary valve and valve box which will permit repair of the hydrant without shutting down the main supplying to the hydrant. Such auxiliary valves shall be resilient seat gate valves. The auxiliary valve shall have mechanical joint-flange joint. The valve shall be connected directly to the water main using a flange joint tee, Megalug® retainer gland, and thrust block.
- I. Hydrants shall not be located within 20 ft. of any building, and shall not be blocked by parking. The large hydrant port should face the road or travelway.
- J. A 5 ft. x 5 ft. by 4 in. deep concrete hydrant pad shall be placed around the hydrant in all situations. The bottom hydrant flange shall be separated from the pad by 2 in. (see Standard Drawing WL-401).
- K. Guard posts, a minimum of 3 ft. high, shall be required for protection from vehicles when necessary. Such protection shall consist of 4 in. diameter steel pipes, 6 ft. long, filled with concrete, and buried a minimum of 3 ft. deep in concrete, and located at the corners of a 6 ft. square with the hydrant located in the center. Use of posts other than at the four corners may be approved by the City Engineer.

4.0033 Air Release Valves

When designated by the City Engineer, air release valves, per Standard Drawing WL-405, shall be installed. Such valves shall be required on large diameter lines at all high points in grade. Air release valves shall be installed and completed prior to testing of the new water system. (Resolution 05-10 4/11/05)

4.0034 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 shall be reviewed and approved by the City Engineer and shall meet the following criteria.

1. Vaults located in the Public Right-of-Way or in the paved areas shall be traffic rated per AASHTO H-20.
2. Vault shall be equipped with an approved ladder.
3. All vault wall openings shall be sealed with non-shrink grout.
4. All vaults shall have approved gravity drain.
5. Cla-Val brand device, or equal, shall be used.
6. Pipe and device shall be centered in the vault and have a clearance of 12 in. minimum to 48 in. maximum off the floor and shall be supported with approved pipe support.
7. All piping inside the vault shall be restrained.
8. Pressure-reducing valves shall be installed and completed prior to testing of the new water system. (Resolution 05-10 4/11/05)

4.0035 Railroad or Freeway 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 freeway crossings, if required, shall be as noted in the permit from the respective agency.

4.0040 Backflow Prevention

Backflow prevention devices shall be required on all 1-1/2 in. and larger water services.

4.0050 Water Service Lines

- A. The sizes of water service lines which may be used are 1 in., 2 in., 4 in., 6 in., 8 in., 10 in., and 12 in. Water service lines will be reviewed for effects on the distribution system and shall not be greater in size than the distribution main.
- B. For 2 in. and greater services, a design drawing must be submitted showing the vault and fitting requirements with the expected flow (normal and maximum day flow) requirements and proposed usage.
- C. Domestic service lines 1 in. through 2 in. shall normally extend from the main to behind the curb, with a meter curb stop and meter box located at the termination of the service connection (Standard Drawing WL-402 and WL-03). Meter to be provided and installed by City. 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 18 in. each side of a common side property line in the planter area. If, under existing circumstances, the meter placing was approved by the City in the approach or in the sidewalk area – a full metal traffic lid shall be provided. (Resolution 05-10 4/11/05)
- D. When a corrosive potential condition is encountered and the copper service passes over or under an active cathodic protection system, the service will be installed in a Schedule 40 PVC conduit for a distance of 10 ft. on each side of the active system. All conduit placements will be as-built.
- E. Fire Service - There are three categories of private fire services:
 1. Hydrants

2. Fire sprinkler lines
 3. Combination hydrant and fire sprinkler lines
- F. The water fire service line shall normally extend from the main to the property line and end with a vault metering device and valves. An approved backflow prevention device will be required of the property being served.
- G. 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 Engineer. The vault shall contain all valves, fittings, meters, and appurtenances required for fire service to the development.

4.0060 System Testing

All new water systems (lines, valves, hydrants, and services) shall be individually pressure tested, chlorinated, and tested for bacteria. All testing shall be performed in accordance with **DIVISION FOUR – WATER TECHNICAL REQUIREMENTS**, of the West Linn Public Works Standard Construction Specifications and in the presence of a City inspector.

4.0070 Water Quality Sampling Stations

Water sampling stations will be required as directed by the City Engineer.

4.0080 Pressure Regulating Valve

4.0081 General

The package-type pressure reducing valve (PRV) station shall be a pre-engineered and shop assembled station. The package PRV station shall be delivered to the job site requiring no additional fabrication or similar work, other than placement and connections to supply and discharge pipes necessary for a fully functional unit.

All equipment specified in this section shall be Cla-Val brand.

4.0082 Experience Requirements

The manufacturer shall have a minimum of 10 years experience in manufacturing PRV stations and shall have completed at least ten prior successful installations, within the Pacific Northwest area, of package-type PRV stations similar in size and scope to the installation specified.

4.0083 Station Enclosure

Valve Chambers shall be two-piece, pre-cast, reinforced concrete, H²O load rated with openings to accommodate all piping and mastic for seam. Size of Chamber shall be determined per application. Chamber interior shall be painted with White CS55 sealant to improve lighting. Chamber exterior shall be sealed with Black CS55 sealant or insulated with polyurethane foam as required to provide a watertight enclosure. Chamber shall have provision for 30 in. manhole frame with cover or access hatch. Link Seal Assemblies shall be furnished on any pipe penetrations.

4.0084 Valves and Accessories to be Furnished in Vault

- A. Mainline and Bypass Control Valves (Determined by Flow Requirements)
- B. Gate Valves to match Control Valve size
- C. Line size Main and Bypass Strainers

- D. Inlet and Outlet liquid filled Pressure Gauges
- E. Mainline Outlet Air/Vac Valve
- F. Victaulic Couplings on Main and Bypass Piping
- G. Aluminum Ladder w/ Safety Post
- H. Galvanized Steel Pipe Supports.
- I. EBBA Iron Transition Couplings on Inlet and Outlet Piping
- J. Hydraulic Sump Drain Assembly
- K. 3/4 in. Hose Bib Assembly with Vacuum Breaker

4.0085 Piping

All pipe to be fabricated from schedule 40 steel to AWWA M11 steel pipe design standards. Finished pipe to be sandblasted, epoxy lined and coated with NSF61 approved epoxy to AWWA C210 specifications.

4.0086 Execution

The Contractor shall furnish and install the complete package PRV station, consisting of the PRVs, isolation valves, air release valves, sump pumps, piping, and controls, mounted in a concrete chamber enclosure.

1. The unit shall be installed at the location shown on the plans approved by the City.
2. The installation of the PRV station shall require witness and approval from the City Water Testing Department Staff.
3. Any adjustment to the PRV package required after installation shall be done by the City Water Department Staff.

4.0087 Testing and Start-Up

The package PRV station shall be pressure tested by the Contractor in the presence of City staff, after installation, to check for leaks in all piping, valves and seals. Start-up will be conducted by the manufacturer's representative, and will consist of simulating flow demand requirements by operating a fire hydrant in the system. Normal sequencing of PRVs shall be simulated, and appropriate pressure settings shall be made. All irregularities shall be corrected to the satisfaction of the City Engineer or engineer's representative.