

CITY OF DAYTON
Public Works Design Standards

Division 5

Water Distribution

DIVISION 5 WATER DISTRIBUTION

5.1 PURPOSE

a. In addition to the purposes outlined under Division 1 of these PWDS, the intent and purpose of these Standards is to ensure the development of a water distribution system which will:

- 1) be of adequate design to meet all expected domestic, commercial and industrial demands including fire flows within the design life;
- 2) have sufficient structural strength to withstand all external loads which may be imposed;
- 3) be of materials resistant to both corrosion and erosion with a minimum design life of 75 years;
- 4) be economical and safe to build and maintain;
- 5) meet all design requirements of the Oregon Health Authority – Drinking Water Services (OHA-DWS).

Alternate materials and methods will be considered for approval on the basis of these objectives.

b. These Standards cannot provide for all situations. They are intended to assist but not to substitute for competent work by professional design engineers.

5.2 APPLICABILITY

a. These Standards shall govern all construction and upgrading of all public water distribution and associated facilities under the jurisdiction of the City of Dayton and applicable work within the City's service areas.

b. Permanent water distribution facilities shall be provided to serve all properties within the City of Dayton service areas in accordance with these Standards. This shall generally be interpreted to mean that permanent water distribution facilities shall be provided for existing legal lots of record at the time development occurs, and for new legal lots of record (*created by partitioning or subdivision of land*) at the time of partitioning or subdivision.

5.3 SPECIAL ITEMS

- a. The design of the following are considered special items and are not covered in detail in these Standards:
 - 1) Water Distribution Pump Stations (*capable of providing design flows with largest single pump out of service*).
 - 2) Reservoirs
 - 3) Public Wells
 - 4) Water Treatment Plants
 - 5) Pressure Regulating Devices
 - 6) Flow Measurement Devices
 - 7) Relining of the Existing Water Mains
 - 8) Chemical Addition or pH Adjustment
 - 9) Bridge Crossings
 - 10) Creek or Stream Crossings
- b. Review and approval of the above special items by the City Engineer and Public Works Director shall be required. When requested by the City, full design calculations shall be submitted for review prior to approval. Special items may also require review and approval by the OHA-DWS as applicable.

5.4 APPROVAL OF ALTERNATE MATERIALS AND METHODS

- a. Any alternate material or method not explicitly approved herein will be considered for approval on the basis of the objectives set forth in Paragraph 5.1, Purpose. Persons seeking such approval shall make application in writing to the City Engineer and Public Works Director. Approval of any major deviation from these Standards shall be in written form. Approval of minor matters will be made in writing, if requested. Any and all such requests shall be submitted in writing to the Public Works Director prior to City approval of the design drawings.
- b. Any alternate must meet or exceed the minimum requirements set forth in these PWDS (*also see "equal" & "substitute" definitions under PWDS 1.4*).
- c. The written application is to include, but is not limited to, the manufacturer's specifications and testing results, design drawings, calculations and other pertinent information.
- d. Any deviations or special problems shall be reviewed on a case-by-case basis and approved by the City Engineer and Public Works Director. When requested by the City, full design calculations shall be submitted for review with the request for approval.

5.5 CONSTRUCTION DRAWINGS

- a. Construction drawings shall conform to the requirements of Division 1 of these PWDS.
- b. Detail drawings shall be included on the construction drawings for all water system appurtenances including but not limited to valves, blowoffs, hydrants, service connections, couplings, etc.

5.6 CITY STANDARD DETAILS

- a. City standard details included in the appendix are supplemental to the text of these PWDS and show the City's minimum requirements for the construction of certain standard system components.
- b. In the case of conflicts between the text of these PWDS and the City standard details, the more stringent as determined by the City Engineer and Public Works Director shall apply.
- c. As required by Division 1 of these standards, all applicable City standard details shall be included on the construction drawings. Details shall be placed in numerical order on the detail sheets (*oriented from top left of each sheet to bottom right*), for ease of reference during construction.

5.7 DEFINITIONS AND TERMS

- a. In addition to the definitions contained in Division 1 of these Standards, the following definitions may apply particularly to water distribution systems. Unless otherwise defined in these PWDS, the following definitions and abbreviations shall apply whenever used. Other definitions as outlined in the Oregon Plumbing Specialty Code (OPSC) shall also apply.
 - 1) Abbreviations: Acceptable abbreviations for showing types of new and existing pipe materials on the plans are as follows:
 - a) CI - Cast Iron
 - b) DI - Ductile Iron
 - c) PVC - Polyvinyl Chloride
 - d) STL - Steel
 - e) AC - Asbestos Cement
 - 2) Air Gap Separation: A physical vertical separation between the free-flowing discharge end of a potable water supply and the rim of any open, non-pressurized receiving vessel.
 - 3) Approved Backflow Prevention Assembly: An assembly that has been investigated and approved by the OHA-DWS for preventing backflow.

- 4) Backflow: The flow of water or other fluids in a direction opposite to the normal flow. (See *Back-Siphonage*.)
- 5) Back-Siphonage: The flowing back of used, contaminated, or polluted water from a plumbing fixture or vessel into a water supply pipe due to a negative or reduced pressure in such pipe.
- 6) Building Supply: The pipe carrying potable water from the water meter or other source of water supply to a building or other point of use or distribution on the lot. Building supply shall also mean customer line.
- 7) Cross Connection: Any connection or arrangement, physical or otherwise, between a potable water supply system and any plumbing fixture or any tank, receptacle, equipment or device, through which it may be possible for non-potable, used, unclean, polluted and contaminated water, or other substances, to enter into any part of such potable water system under any condition.
- 8) Customer Water Supply System: The water supply system of a building, premises or private system consists of all supply pipe from the customer side of the water meter, including water service pipes, and the necessary connecting fittings, control valves, pipe and all appurtenances carrying or supplying potable water in or adjacent to the building premises served.
- 9) Distribution Mains: All mains which are not designated as transmission mains, and which are used for supply the individual consumer. As a general rule these are the smaller mains in the water supply system.
- 10) Distribution System: Distribution main pipelines, pumping stations, valves and ancillary equipment used to transmit water from the supply source to the service line.
- 11) Double Check Valve Assembly: An assembly composed of two single, independently acting check valves, including tightly closing shut-off valves located at each end of the assembly and fitted with properly located test ports.
- 12) Double Detector Check Valve Assembly: A line-sized approved double check valve assembly with a parallel meter and meter-sized approved double check valve assembly. The purpose of this assembly is to provide double check valve protection for the distribution system and at the same time provide partial metering of the fire system showing any system leakage or unauthorized use of water.
- 13) Fire Hydrant Assembly: Fire hydrant, hydrant lead, mainline hydrant valve, mainline tee, and thrust restraint at the hydrant and the mainline tee.
- 14) Fire Protection Services: A connection to the public water main intended only for the extinguishment of fires and flushing necessary for its proper maintenance. All fire services connected to building sprinkler systems and/or

private fire hydrants shall have a double check detector assembly. The connection of the fire protection service to the public mainline shall be the service connection, and the entire portion of the fire protection service from the isolation valve at the public mainline connection to the building shall be the sole responsibility of the property owner for maintenance and/or repair (*ie. as a private service line*). Water meter service taps are not allowed on fire protection services or fire hydrant leads.

- 15) Fixture Unit Equivalents: The unit flow or demand equivalent of plumbing fixtures as tabulated in the Oregon Plumbing Specialty Code (OPSC).
- 16) Hydrant Lead: The pipe connecting the fire hydrant to the isolation valve at the connection to the City water main or private fire line. Water meter service taps are not allowed on fire protection services or fire hydrant leads.
- 17) Irrigation Service: A metered connection intended for seasonal use and delivering water which is not discharged to the sanitary sewer.
- 18) ISO: Insurance Service Office.
- 19) Mainline Hydrant Valve: The isolation valve between the City water main or private fire line and the fire hydrant.
- 20) OHA-DWS: Oregon Health Authority, Drinking Water Services.
- 21) Oregon Plumbing Specialty Code (OPSC): The Uniform Plumbing Code, current edition as revised by the State of Oregon, called the "Oregon Plumbing Specialty Code."
- 22) Potable Water: Water which satisfactory for drinking, culinary and domestic purposes and meets the requirements of the health authority having jurisdiction.
- 23) Private Distribution System: A privately owned and maintained water distribution system serving an industrial or commercial subdivision or a multi-building development on a single lot served through a master meter installed at the approved location. Private distribution systems must have a single entity responsible for the system. Resale of water without written approval of the City shall be prohibited.
- 24) Transmission Mains (Supply Lines): Mains which are used for transporting water from the source of supply and storage reservoirs to the centralized point of distribution and distribution reservoirs. Transmission mains may or may not supply individual consumers, but they are sized and located to transport water from centralized points of distribution to various points of interconnection with the grid system and centralized points of consumption.
- 25) Uniform Plumbing Code: The Uniform Plumbing Code adopted by the International Association of Plumbing and Mechanical Officials, current edition

as revised by the State of Oregon, called the "Oregon Plumbing Specialty Code."

- 26) Water Main: A water-supply pipe for public or community use.
- 27) Water Master Plan: The Water System Evaluation and Master Plan for the City of Dayton, Oregon, most recent revisions.
- 28) Water Service Line: The waterline or pipe extending from the distribution main to the water meter, or to the backflow prevention device or private fire system double check valve (*for water services without an in-line water meter*).

5.8 MATERIALS

a. General

- 1) Unless otherwise approved by the City Engineer, materials shall conform to the minimum requirements outlined herein and as shown on the City standard details.
- 2) In the case of conflicts between the provisions of these PWDS and the PWCS, the more stringent as determined by the City Engineer and Public Works Director shall apply. Acceptable materials shall be as outlined in these PWDS.
- 3) It is not intended that materials listed herein are to be considered acceptable for all applications. The design engineer shall determine the materials suitable for the project to the satisfaction of the City Engineer.
- 4) All materials or products which will come in contact with or which will be used on material or products which will come in contact with potable water shall conform to the requirements of OAR 333-61-087, Product Acceptability Criteria or the National Sanitation Foundation (NSF) Standard 61, Drinking Water System Components - Health Effects as approved by the OHA-DWS.
- 5) Material/Equipment Submittals from Contractor Required. Per Section G-1300, construction submittals shall be provided by the Contractor for review by the City, for all material & equipment which will be incorporated into work covered under the PWDS.
- 6) Granular backfill shall be ¾"-0 conforming to OSSC (ODOT/APWA) 02630.10 (Dense Graded Base Aggregate), with no more than 10% passing the #40 sieve and no more than 5% passing the #200 sieve.

b. **Mainline Pipe**

- 1) **Mainline Pipe Type.** Unless otherwise shown on plans approved by the Public Works Director, all public water mains shall be C-900 PVC (DR 18) or Class 52 ductile iron as follows.
 - a) 12" & smaller water distribution mains, normal depth – C900 PVC pipe
 - b) Shallow depth & major transmission mains – DI pipe
 - c) Waterlines through bore casings – DI pipe.
 - d) Waterlines under streams or major culvert crossings – DI pipe.
 - e) Waterlines across bridges – restrained joint DI pipe.
 - f) Portion of 4" & larger water service lines within public right-of-way - DI pipe.
 - g) Fire hydrant leads (*from mainline to hydrant*) - DI pipe.
 - h) Portion of fire service lines within public right-of-way - DI pipe.
- 2) **PVC (AWWA C-900)**
 - a) PVC pressure pipe 4-inches through 24-inches in diameter shall conform to the requirements of AWWA C-900-16 (*design stress of 4000 psi*), NSF approved, with cast iron pipe equivalent (CI) outside diameter dimensions. Pipe shall be PVC pipe with wall thickness equivalent to a standard dimension ratio (SDR) of 18.
- 3) **Ductile Iron**
 - a) Where ductile iron pipe is used for water distribution, pipe shall be Class 52 ductile iron pipe with push-on joints conforming to AWWA C-151, and cement-mortar lined and seal coated in accordance with AWWA C-104 (*ductile iron pipe threaded for flanges shall be Class 53*).
 - b) All ductile iron pipe and fittings buried underground shall be coated on the outside with a standard coating of black bituminous paint a minimum of 1 mil thick unless otherwise specified.
 - c) All ductile iron pipe within a single project shall be of the same manufacturer.
- 4) Rubber-ring gaskets for push-on joints shall be furnished by the pipe manufacturer to ensure compatibility with the gasket groove in the push-on bell end. Gaskets shall be suitable for the specified pipe sizes and pressure.
- 5) Restrained joint PVC pipe shall be used in locations and configurations as required by the City Engineer (*Diamond Lok-21, Eagle Loc 900, TerraBrute CR or approved equal, as approved by the City Engineer and Public Works Director for the specific application*).

c. **Bolts & Nuts for MJ Joints & Flanged Joints**

1) **Mechanical Joints**

- a) MJ joints shall be provided with Corten tee-head bolts and nuts (*ASTM A242, high strength, low alloy steel conforming with AWWA C-111*).

2) **Flanged Joints**

- a) As a minimum, all nuts and bolts used for flanged joints shall conform to the requirements of ASME/ANSI B18.2.1 and shall be high strength, low carbon steel conforming to the requirements of ASTM A-307 Grade B, zinc plated steel conforming with AWWA C-111.

3) **Areas with Corrosion Concerns**

- a) For any areas where required by Public Works Director, MJ and flanged joints shall be provided with bolts and nuts (*low alloy steel conforming with AWWA C-111*) coated with a zinc base coat and a Xylan fluoropolymer top coating (*or approved equal*) for corrosion control and to control thread friction torque during tightening (*Romac R-Blue, TriPac 2000 Blue or approved equal*).

d. **Fittings**

1) **Mechanical Joint Fittings**

- a) All MJ tees, crosses, elbows, reducers, adapters, combinations thereof, and other miscellaneous fittings 4-inches through 24-inches in diameter shall be ductile iron compact fittings in conformance with AWWA C-153.

- b) The minimum working pressure for all MJ cast iron or ductile iron fittings 4-inches through 24-inch in diameter shall be 350 psi.

c) **Retainer Glands for MJ Joints**

- (1) Retainer gland casting bodies shall have all surfaces fusion bond powder coated (*polyester or nylon based*) after pretreatment with a phosphate wash, rinse & sealer coating (*Mega-Bond or approved equal*).
- (2) Retainer gland set wedge bolts and set wedge assemblies shall have all surfaces coated with a minimum of two coats of fluoropolymer coating or approved equal coating (*to control thread friction torque during tightening of set wedges*).
- (3) Retainer glands for use on MJ joints shall be "Mega-Lug" as

manufactured by EBAA Iron Inc. (*color coded based on the type of compatible pipe*), or approved equal.

2) Flanged Fittings

- a) All flanged tees, crosses, elbows, reducers, adapters, combinations thereof, and other miscellaneous fittings 4-inches through 48-inches in diameter shall be cast iron or ductile iron fittings in conformance with AWWA C-110.
- b) The minimum working pressure for all flanged cast iron or ductile iron fittings shall be 250 psi.

e. Couplings

- 1) Couplings shall be limited in their application to connection of new pipe work to existing waterlines, temporary installations, and where specifically approved by the City Engineer.
- 2) Mechanical joint couplings shall have minimum pressure ratings that will accommodate maximum pressures which will be experienced during hydrostatic and leakage testing.
- 3) Unrestrained Couplings. Unrestrained mechanical joint sleeve couplings and adapters shall be long-style solid sleeve type couplings consisting of a fusion bond epoxy coated ductile iron sleeve, ductile iron follower rings, rubber gaskets, and corrosion-resistant bolts and hex nuts (*zinc plated*). Unrestrained long sleeve couplings shall be Tyler Pipe, UFCO, Star, Sigma or approved equal. Hymax Wide Range Couplings are allowed as an alternative to unrestrained MJ sleeve couplings.
- 4) Restrained Couplings. Unless otherwise specifically specified or noted on the drawings, restrained sleeve couplings up to 12-inch diameter shall be Krausz Hymax Grip Coupling, or approved equal (*Romac Alpha Coupling*), consisting of a fusion bond epoxy coated two bolt coupling with all cast components (*end rings, center ring, bolt guides, gripper teeth*) of ductile iron, NBR gaskets, stainless steel hardware, stainless steel bolts & anti-gall e-coated nuts.

Restrained couplings outside of the available size ranges for the specified restrained couplings shall be MJ long-style solid sleeve type couplings (*as specified above for unrestrained couplings*) with retainer glands per City standards (*MegaLug or approved equal*).
- 5) Dresser type couplings are not an approved option unless specifically approved by the Public Works Director. Applications shall be limited to transitions between pipe types for which mechanical joint couplings are not available.

f. **Mainline Valves**

1) **General**

- a) All mainline valves and appurtenances shall have the name, monogram, or initials of the manufacturer cast thereon. They shall be built and equipped for the type of operation as specified herein or as shown on the drawings.

2) **Valve Operators**

- a) All valve operators shall be totally enclosed traveling nut type manual operators, sealed and lubricated for underground service.
- b) All buried valves shall be supplied with a 2-inch square operating nut, and shall open to the left (*ie. counterclockwise*). Nuts shall have a flanged base on which shall be cast an arrow at least 2-inch long with the word "OPEN" cast on the nut to clearly indicate the direction of opening.
- c) Extension stems shall be provided for buried valves when the operating nut is four (4) feet or more below finished grade. Extension stem shall extend to within twelve (12) inches (*maximum*) of the finished ground surface and shall be provided with spacers which will center the stem in the valve box.

3) **Valve Boxes (VB)**

- a) All buried valves shall be provided with new valve boxes, including new valves installed by the Contractor, or existing valves which are excavated around as part of the work, and existing valves which are located within newly paved, newly concreted or newly graveled surfaces.
- b) Valve boxes shall conform to City standard details (*reuse of existing valve boxes will only be allowed if they fully conform with current City standard details, are accurately centered on the valve nut, are clean of excess rock or debris around the valve nut, and are approved in writing by the City*). All valve boxes shall be provided with 3034 PVC riser pipes, length as required.
- c) All valve boxes noted above (*new and reused existing valves*) shall be provided with VC212 self centering valve box bases with integral rubber fingers to exclude rock from around the valve nut, as manufactured by 3 Dimensional Contracting, or approved equal.

4) **Gate Valves (GV)**

- a) For criteria regarding acceptable location for use of gate valves, see Section 5.16.
- b) All gate valves shall be resilient wedge gate valves conforming to the

requirements of AWWA C-509, except as herein modified.

- c) Gate valves shall be epoxy coated iron-body, resilient wedge non-rising stem gate valves. The wedge shall be cast iron completely encapsulated in an elastomer covering with polymer guide bearing caps on each side. The valves shall have a full diameter waterway with no grooves or recesses at the valve seat location. Flanges, where required, shall be 125 pound, full faced, drilled per ANSI B16.1.
- d) Valves shall be tested and certified by the manufacturer for shut-off at a working pressure of 200 psi and a minimum test pressure of 300 psi.
- e) Gate valves shall be Mueller A-2360, Waterous Series 500 or approved equal.

5) Butterfly Valves (BFV)

- a) For criteria regarding acceptable location for use of butterfly valves, see Section 5.16.
- b) All butterfly valves shall conform to AWWA C-504, except as herein modified. Butterfly valves shall be provided with standard gearing so as to match the same number of turns as a gate valve of the same size (*3 x diameter plus 1 turn to open or closed*).
- c) Butterfly valves shall be epoxy coated short body style AWWA Type-B valves. Flanges, where required, shall be 125 pound, full faced, drilled per ANSI B16.1.
- d) Valve operators shall be enclosed traveling nut type manual operators, sealed and lubricated for underground service, and shall be rated for submerged operation up to 10 psi (*±23 feet*).
- e) Valves shall be tested and certified by the manufacturer for shut-off at a working pressure of 150 psi and a minimum test pressure of 300 psi.
- f) Butterfly valves shall be Pratt Groundhog series, or approved equal.

6) Valve Coating

- a) All valves shall be furnished with a fusion-bonded epoxy coating inside and outside conforming to the requirements of AWWA C-550.

g. Service Pipe and Fittings

- 1) For criteria regarding tapping requirements, see Section 5.19.
- 2) All services that are saddle tapped shall use ductile iron service saddles with stainless steel bolts and double strap clamps per City standard details. All

ductile iron service saddles shall be furnished with a fusion bonded epoxy or nylon coating conforming to the requirements of AWWA C-550, Romac 202NS, Ford FC202 or approved equal, or per City standard details.

- 3) Unless otherwise required by the City Engineer or the Public Works Director, single residential service pipe shall be a minimum of 1-inch in diameter.
- 4) Unless otherwise approved by the City Engineer or the Public Works Director, commercial or industrial service pipe shall be a minimum of 1½-inches in diameter (*reducers to be installed at meter location as applicable*).
- 5) **Compression Insert Stiffeners.** All service connections to HDPE service pipe shall be compression fittings, with 2-3/8” long compression insert stiffeners provided for all HDPE connections per manufacturer’s recommendations (*AY McDonald 6133T CTS insert stiffener or equal*). All service connections to copper pipe shall be compression fittings.
- 6) **No-Lead Service Brass.** All service brass shall be manufactured from no-lead alloy conforming with UNS/CDA C89833, and shall have the letters “NL” cast into the body for proper identification.
- 7) **Tracer Wire.** A continuous 12 gauge solid core copper toning wire shall be installed along all non-copper water service lines from the mainline to the meter box.

All tracer wire splices shall be made with corrosion resistant waterproof wire nuts (*DBR direct bury splice kit by 3M Company, or equal*).

- 8) **1-inch Services** (*pipe & fittings*)
 - a) Unless otherwise specified herein, water service lines shall be blue HDPE tubing (*CTS, SDR 9, 200 psi rated*) conforming to AWWA C901 (ASTM D2239 & D2737), with long style compression insert stiffeners as specified above and Q style compression fittings (*Cencore or approved equal*). All water services shall be continuous HDPE without splices.
 - b) All corporation stops shall be brass ball valve corporation stops rated to 300 psi with iron pipe thread inlet and compression outlet to adapt to HDPE copper tube size (CTS) pipe. Corporation stops shall be Ford FB-1100-4Q or approved equal.
 - c) Each individual water service line shall be equipped with a full size locking ball valve meter stop assembly at the inlet to the meter. All meter stop assemblies shall be brass with copper pipe connector as appropriate and outlet for meter coupling.
 - d) Meter stops for 3/4-inch and 1-inch meters shall be 1-inch locking angle

ball valves with compression inlet. 1-inch meter stops shall be Ford BA43-444WQ, or approved equal. Provide all services with a 1" x 3/4" adapter on the meter stop for each 1" service.

- e) Where permitted, service line couplings shall be compression style couplings. Couplings (*where approved by Public Works Director*) shall be Ford C44-44Q coupling or approved equal, with long style compression insert stiffeners as specified above.

9) **1½-inch and 2-inch Services** (*pipe & fittings*)

- a) 1½-inch water service lines for shall be either blue HDPE tubing (*CTS, SDR 9, 200 psi rated*) conforming to AWWA C901 (ASTM D2239 & D2737), with long style compression insert stiffeners as specified above and Q style compression fittings (*Cencore or approved equal*), or Schedule 80 PVC pipe. All fittings on PVC pipe shall be Schedule 80 PVC. Use IPS Weld-On purple primer P70 with 711 glue or approved equal.
- b) 2-inch water service lines shall be Schedule 80 PVC pipe. All fittings shall be Schedule 80 PVC. Use IPS Weld-On purple primer P70 with 711 glue or approved equal.
- c) 1½-inch and 2-inch water services shall be provided with high bypass copper-setters for flanged meters, Ford VBB76-12HB-11-66 (1½") or VBB77-12HB-11-77 (2") high locking bypass or approved equal conforming to City standard details.
 - (1) The copper-setter shall be provided with ball valves on the inlet and outlet, with inlet valve provided with a lockwing and the outlet valve provided with a handle.
 - (2) The bypass line shall be 1-inch diameter minimum, and shall be provided with a lockwing ball valve.
- d) 2-inch and larger services shall have a mainline tee with flanged side outlet, with a flange x MJ resilient wedge gate valve on the service leg of the tee. 2-inch services shall be provided with a 4" tee and valve, with restrained MJ plug tapped to accept the service pipe adapter (*thread x compression*) per City standard details.

10) **3-inch and Larger Services** (*pipe & fittings*)

- a) 3-inch and larger water service lines shall be reviewed on a case-by-case basis. Pipe and fittings shall be as required by the City Engineer and the Public Works Director.
- b) All services 3-inch and larger shall be Class 52 ductile iron pipe, with

ductile iron fittings. Provide retainer glands on all MJ joints, and field-lock type gaskets on all push-on joints.

Per PWDS 5.7, the entire portion of the fire protection service from the isolation valve at the public mainline connection to the building shall be the sole responsibility of the property owner for maintenance and/or repair.

- c) 3-inch and larger services shall have a mainline tee with flanged side outlet and a flange x MJ resilient wedge gate valve conforming to the requirements specified herein.
- d) The meter assembly shall include a lockable bypass and may require a backflow preventer if required by Public Works Director.

11) **Fire Services** (*pipe & fittings*)

- a) All fire service lines shall be reviewed on a case-by-case basis by Public Works and the Fire District. Pipe and fittings shall be as required by the City Engineer and the Public Works Director.
- b) The portion of all fire services within the public right-of-way or within utility easements to the City shall be Class 52 ductile iron pipe, with ductile iron fittings. Provide retainer glands on all MJ joints, and field-lock type gaskets on all push-on joints.
- c) All fire service connections shall have a minimum 4-inch mainline tee with flanged side outlet and a flange x MJ resilient wedge gate valve conforming to the requirements specified herein.
- d) DCDA (Double Check Detector Assembly). As a minimum, each fire service connection shall be provided with a double check detector assembly (*exception noted below*) with a City approved meter & read head on the detector loop (*ie. in addition to the double check required on the detector loop*).
- e) RPDA (Reduced Pressure Detector Assembly). Where anti-freeze compounds or any chemicals are added to a fire sprinkler system (OR where it is possible for a fire sprinkler system to be connected to or augmented by any auxiliary water source), each fire service connection shall be provided with a Reduced Pressure Detector Assembly (RPDA) with a City approved meter & read head on the detector loop (*ie. in addition to the reduced pressure assembly required on the detector loop*).
- f) Detector Loop Meter. For each DCDA or RPDA, the Contractor is responsible for coordinating with Public Works as necessary in order to obtain, provide and install an approved water meter on the detector

loop which includes transmitter accessories compatible with the City's existing meter reading system.

h. Water Meter Boxes

- 1) Unless otherwise approved by the Public Works Director, all meter boxes must be as shown below:

WATER METER BOXES¹			
Service Line Size	Non-Traffic Area ²	Traffic Area ²	Inside Dimensions
3/4-inch & 1-inch	Box – DFW1324C4-12-BODY Lid – DFW132C-4T-LID ¹	Same	13" x 24"
1½-inch & 2-inch	Box – DFW2436C4-18-BODY Lid – DFW2436C-4T-LID ¹	Same	24" x 36"
3-Inch and larger	Vault built to Public Works requirements, w/ aluminum hatch, OSHA ladder, cast-in-place floor with sump per details, sump pump & lockable bypass (<i>see City standard details</i>).		
¹ Meter boxes and/or piping which do not provide all required clearances and spacing so as to allow installation of City's standard meter (<i>without removing the box or vault, and without reconfiguring piping</i>) will be required to be reset or replaced by the developer or builder (<i>at their sole expense</i>), prior to installation of the meter. ² – See requirement below for AMR/AMI lid configuration.			

- 2) Meter boxes shall be H20 rated polymer boxes with covers configured for AMR sensors and containing an embedded locator magnet.

i. Fire Hydrants

- 1) Unless otherwise required by the Dayton Fire District, all fire hydrants shall conform to the following:
- a) All fire hydrants shall be improved, dry barrel, 5¼-inch compression type valve, traffic model.
 - b) Fire hydrants shall be equipped with two 2½-inch hose ports (NST), one 4½-inch pumper port (NST) with Storz adapter as specified, 1½-inch pentagon nut, and barrel drains.
 - c) Fire hydrants shall be oriented so as to optimize access to ports, or as directed by the City Engineer or Fire Code Official.
 - d) Fire hydrants shall be Kennedy Guardian K81D, and shall be factory coated yellow with powder coat epoxy. Provide Storz adapter & cap per standards details.

j. **Mainline Blowoffs**

- 1) Mainline blowoffs shall conform with City standard details.
 - a) **Primer Required.** For all PVC pipe with solvent cement joints, use of purple primer (*IPS Weld-On P70 Industrial Grade or equal*) is mandatory (*see also OPSC 605.12.2*), with gray medium body PVC cement (*IPS Weld-On 711 Industrial Grade or equal*).
- 2) Minimum allowable blowoff size shall be as outlined under Section 5.12. Blowoffs shall be sized to provide adequate flushing velocities as approved by the City Engineer.
- 3) Unless otherwise shown or authorized by the City Engineer, all blowoffs shall be provided with valve boxes and/or meter boxes as shown in the City standard details.

k. **Mainline Tapping Tees**

- 1) Tapping tees used for making connections to existing, in-service lines shall be all stainless steel construction (*including stainless steel flange*) with full perimeter gasket, and shall have Class 125 outlet flanges. In all cases, the tapping tee shall be designed for use with the existing pipe materials and O.D. equivalent.
- 2) All tapping valves shall be resilient wedge gate valves furnished with a fusion bonded epoxy coating inside & outside conforming to the requirements of AWWA C-550.
- 3) Any company performing mainline taps shall be prequalified with the City prior to performing any work on a project.
- 4) Contractors shall coordinate all taps with City Public Works and perform work with Public Works staff present.

l. **Underground Warning Tape**

- 1) Warning tape shall conform with the requirements noted on the City standard details and standard construction notes (*6-inch width, blue color & "Caution: Buried Water Line Below" or approved equal printed continuously down the length of the tape*).
- 2) Underground warning tape shall be detectable or non-detectable acid and alkali resistant safety warning tape. The tape shall consist of a minimum 4.0 mil (0.004") thick, virgin low density polyethylene plastic film formulated for extended use underground. The tape shall be in accordance with the APWA national color code and shall be permanently imprinted in lead free black pigments suitable for direct burial.

m. **Toning / Tracer Wire**

- 1) A continuous insulated 12 gauge solid core copper toning wire shall be supplied with non-metallic pipe. Insulation shall be blue in color for potable water piping.

All tracer wire splices shall be made with corrosion resistant waterproof wire nuts (*DBR direct bury splice kit by 3M Company, or equal*).

- 2) Additional wire shall be supplied as necessary to allow the toning wire to be looped up at all valve boxes on all lines.

n. **Concrete (Cast-in-Place) Thrust Restraint.**

- 1) All concrete shall conform to the requirements of OSSC (ODOT/APWA) 00440, Commercial Grade Concrete, 3300 psi min @ 28 days, max 5" slump, 4.5% air ($\pm 1.5\%$). Concrete mix design shall be submitted to the City for review and approval prior to use.
- 2) If hand mixed sack-crete type concrete is proposed by the Contractor and approved by the Public Works Director, it shall be a 4000 psi minimum mix (*approved by the City prior to use*), mixed with the minimum amount of water necessary for workability (*5" slump or stiffer*).
- 3) In no case will dry sack-crete (*either in bags or as loose mix*) be considered as an acceptable substitute for an approved concrete mix, placed as specified herein or on the drawing details.

o. **Bore Casings and Accessories**

- 1) Installation of public water mainline pipe inside of a casing pipe requires specific approval by the Public Works Director on a case-by-case basis.
- 2) Carrier pipe installed inside steel bore casings shall meet the minimum specifications contained herein. Casing pipe shall be of a size to permit proper construction of the carrier pipe to the required lines and grades.
- 3) Casing shall be welded smooth steel pipe conforming to the requirements of ASTM A-53 or approved equal, with a minimum yield strength of 35,000 psi.

- 4) Minimum casing size and wall thickness shall be as outlined below. Casing wall thickness shall conform to these requirements or the requirements of the agency having jurisdiction, whichever is more stringent. Contractor shall be responsible for verifying the bell OD or casing spacer diameter required of actual carrier pipe provided or bore grades specified, as bell diameters or casing spacer requirements may vary between manufacturers. Casing diameter shall be increased as required to allow trimming of casing spacers on grade critical bores, or where required to provide additional clearance between bells and casing. The fact that certain carrier pipe types are listed in this table does not indicate that such pipe type is approved for any particular application (*ie. to avoid repetition, this table applies to water, sewer and storm drainage as applicable*).

Carrier Pipe Nominal Diameter (Inches)	Minimum ¹ Casing Pipe Diameter (Inches)	Casing Wall Minimum Thickness (Inches)
<6"	10 OD / 9.5" ID	0.250 (1/4)
6" DI (CL 52, push-in joint) (Bell OD = ±8.9")	12" OD / ±11.5" ID	0.25 (1/4)
6" PVC C900 (DR 18) (Bell OD = ±8.43")	12" OD / ±11.5" ID	0.25 (1/4)
6" PVC D3034 (DR 35) (Bell OD = ±7.0")	12" OD / ±11.5" ID (18" min. if slope ≤ 2%)	0.25 (1/4) 0.375 (3/8)
8" DI (CL 52, push-in joint) (Bell OD = ±11.2")	14" OD / ±13.37" ID	0.312 (5/16)
8" PVC C900 (DR 18) (Bell OD = ±11.06")	14" OD / ±13.37" ID	0.312 (5/16)
8" PVC D3034 (DR 35) (Bell OD = ±9.36")	14" OD / ±13.37" ID (20" min. if slope ≤ 2%)	0.312 (5/16) 0.375 (3/8)
10" DI (CL 52, push-in joint) (Bell OD = ±13.25")	16" OD / ±15.37" ID	0.312 (5/16)
10" PVC C900 (DR 18) (Bell OD = ±13.57")	16" OD / ±15.37" ID	0.312 (5/16)
10" PVC D3034 (DR 35) (Bell OD = ±11.7")	16" OD / ±15.37" ID (24" min. if slope ≤ 2%)	0.312 (5/16) 0.50 (1/2)
12" DI (CL 52, push-in joint) (Bell OD = ±15.37")	18" OD / ±17.25" ID	0.375 (3/8)
12" PVC C900 (DR 18) (Bell OD = ±16.13")	18" OD / ±17.25" ID	0.375 (3/8)
12" PVC D3034 (DR 35) (Bell OD = ±13.94")	18" OD / ±17.25" ID (24" min. if slope ≤ 2%)	0.375 (3/8) 0.50 (1/2)
14" DI (CL 52, push-in joint) (Bell OD = ±17.85")	22" OD / ±21" ID	0.50 (1/2)

Carrier Pipe Nominal Diameter (Inches)	Minimum ¹ Casing Pipe Diameter (Inches)	Casing Wall Minimum Thickness (Inches)
<u>14" PVC C900</u> (DR 25) (Bell OD = ±17.94")	22" OD / ±21" ID	0.50 (1/2)
<u>15" PVC D3034</u> (DR 35) (Bell OD = ±17.05")	22" OD / ±21.2" ID (24" min. if slope ≤ 2%)	0.50 (1/2) 0.50 (1/2)
<u>16" DI</u> (CL 52, push-in joint) (Bell OD = ±20")	24" OD / ±23" ID	0.50 (1/2)
<u>16" PVC C905</u> (DR 25) (Bell OD = ±20.41")	24" OD / ±23" ID	0.50 (1/2)
<u>18" DI</u> (CL 52, push-in joint) (Bell OD = ±22.2")	26" OD / ±25" ID	0.50 (1/2) 0.50 (1/2)
<u>18" PVC C905</u> (DR 25) (Bell OD = ±22.87")	26" OD / ±25" ID	0.50 (1/2) 0.50 (1/2)
<u>18" PVC F679</u> (PS46) (Bell OD = ±20.85")	24" OD / ±23" ID (28" min. if slope ≤ 2%)	0.50 (1/2)
<u>20" DI</u> (CL 52, push-in joint) (Bell OD = ±24.3")	28" OD / 27" ID	0.50 (1/2)
<u>20" PVC C905</u> (DR 25) (Bell OD = ±25.34")	28" OD / 27" ID	0.50 (1/2)
<u>21" PVC F679</u> (PS46) (Bell OD = ±24.58")	28" OD / 27" ID (30" min. if slope ≤ 2%)	0.50 (1/2)
<u>24" DI</u> (CL 52, push-in joint) (Bell OD = ±28.5")	32" OD / ±31" ID	0.50 (1/2)
<u>24" PVC C905</u> (DR 25) (Bell OD = ±30.27")	34" OD / 33" ID	0.50 (1/2)
<u>24" PVC F679</u> (PS46) (Bell OD = ±27.65")	32" OD / 31" ID (34" min. if slope ≤ 2%)	0.50 (1/2)
<u>27" PVC F679</u> (PS46) (Bell OD = ±31.16")	36" OD / ±34.75 ID	0.625 (5/8)
<u>30" DI</u> (CL 52, push-in joint) (Bell OD = ±34.95")	38" OD / ±36.75" ID	0.625 (5/8)
<u>30" PVC C905</u> (DR 25) (Bell OD = ±37.12")	42" OD / ±40.75" ID	0.625 (5/8)
<u>30" PVC F679</u> (PS46) (Bell OD = ±35.61")	42" OD / ±40.75" ID (44" min. if slope ≤ 2%)	0.625 (5/8)
<u>36" DI</u> (CL 52, push-in joint) (Bell OD = ±41.4")	46" OD / ±44.75" ID	0.625 (5/8)
<u>36" PVC C905</u> (DR 25) (Bell OD = ±44.43")	48" OD / ±46.75" ID	0.625 (5/8)

Carrier Pipe Nominal Diameter (Inches)	Minimum ¹ Casing Pipe Diameter (Inches)	Casing Wall Minimum Thickness (Inches)
36" PVC F679 (PS46) (Bell OD = ±42.82")	48" OD / ±46.75" ID (50" min. if slope ≤ 2%)	0.625 (5/8)
42" PVC F679 (PS46) (Bell OD = ±49.61")	54" OD / ±52.75" ID (56" min. if slope ≤ 2%)	0.75 (3/4)
48" DI (CL 52, push-in joint) (Bell OD = ±54.71")	60" OD / ±58.5" ID	0.75 (3/4)
48" PVC F679 (PS46) (Bell OD = ±56.62")	60" OD / ±58.5" ID (64" min. if slope ≤ 2%)	0.75 (3/4)
¹ Casing diameter shall be increased as required to allow trimming of casing spacers on grade critical bores.		

- 5) The class of casing specified is based upon assumed superimposed loads and not upon the stresses resulting from jacking or boring operations. Any increase in casing strength to withstand jacking or boring operations shall be the responsibility of the Contractor.
- 6) Casing Spacers (Skids)
- a) Casing spacers shall be Model SSI-8 for carrier pipes up to 18 inch diameter and Model SSI-12-2 for larger pipe sizes as manufactured by APS (*Advanced Products and Systems, Inc.*), or approved equal.
 - b) Casing spacers shall be bolt-on style with a shell made of at least two halves. The band material shall be manufactured of a minimum 14 gauge T-304 stainless steel. The runners shall be at least 7 inches long for SSI-8 models and 11 inches long for SSI-12 models, and manufactured of high abrasion resistant and low co-efficient of friction, glass filled polymer.
 - c) The spacer shall have a flexible EPDM liner having a minimum thickness of 0.090 inches, with a hardness of durometer "A" 85-90. The liner shall have a rating of no less than 60,000 VPM and water absorption of 1% maximum. All welds are to be chemically passivated and all hardware to be stainless steel.
 - d) All spacers used for grade critical gravity sewer and storm lines shall have field replaceable runners to allow for grade and elevation adjustment.
 - e) A minimum of three (3) casing spacers per length of pipe shall be required, or 6-foot on center maximum spacing, whichever is greater.

7) End Seals.

- a) Where casings are filled with sand (*gravity or non-pressure pipelines*), end seals shall be grout/masonry end caps with 4" minimum diameter sand feed and vent tubes at each end. The vent tubes shall be plugged with grout after the casing is filled with sand.
- b) Where casings are not filled with sand (*pressure pipelines*), end seals shall be Model AC (*pull-on*) or Model AW (*wrap-around with pressure sensitive butyl mastic strips*) end seals as manufactured by APS, or approved equal, fastened to the casing and carrier pipe with stainless steel bands.

5.9 GENERAL DESIGN CONSIDERATIONS (Water)

- a. Conform with the requirements of the latest Water Master Plan (*see also PWDS 5.10.a*).
- b. Unless otherwise approved or required by the Public Works Director and the City Engineer, the water distribution system shall have sufficient capacity to maintain 40 psi at the building side of the meter for one and two family dwellings. For other development, the distribution system shall have sufficient capacity to provide minimum pressure of 35 psi at the building side of the meter during periods of maximum use, and to provide sufficient volumes of water at adequate pressures to satisfy the maximum expected daily consumption plus fire flows.
- c. Normal working pressure in the distribution system should be approximately 70 psi with a range of 40 psi to 100 psi.
- d. Head loss shall be determined by the Hazen-Williams equation based on the following coefficients.

Hazen-Williams Coefficients	
Pipe Diameter	C Value
8 Inches and Less	100
10 to 12 Inches	110
Greater than 12 Inches	120

- e. Velocities in mains shall normally range from three (3) to six (6) feet per second for average demand to a maximum velocity of ten (10) feet per second for maximum day demand plus fire flow, where pressure headloss is not a concern. In general, maximum headloss for transmission and distribution mains should be limited to 3 feet per 1000 feet

and 10 feet per 1000 feet respectively, provided that acceptable pressure can be maintained under maximum design flow conditions.

- f. A 20 psi residual pressure under fire flow conditions shall be maintained at all meter service connections in the distribution system (*OAR 333-061-0025.7 & OAR 333-061-0050.8.e*), and positive pressure at all other locations. Generally, a maximum velocity of ten (10) feet per second under fire flow conditions will govern for sizing mains at all other locations of the service level where this criteria does not govern.
- g. For purposes of calculating projected headloss through a fire hydrant assembly, the maximum headloss values provided in AWWA C502, Table 5 shall be used (*13 psi headloss @ 1500 gpm through the large steamer/pumper port*). Use of lower headloss values shall be based on a certified headloss curve from the hydrant manufacturer (*ie. based on City approved hydrant*), and the headloss through the 6-inch hydrant lead shall also be accounted for.
- h. Private systems shall limit velocities as required by the Oregon Plumbing Specialty Code (OPSC), Installation Standards.
- i. Utility Separation from Connections to WLs, FHs, etc. Sewer, storm or water service lines (*or franchise utilities*) shall not cross directly under existing or new mainline connections, valves, fire hydrants, or other critical structures, nor shall these water facilities be designed or installed to be over the top of such service lines (*5' minimum horizontal separation typically required*).
- j. **Providing for Future Development (Water)**
 - 1) To & Through. As a condition of water service, all developments will be required to provide (*ie. designed & constructed by developer*) public water mains of sufficient size for fire protection to the development and to adjacent parcels, as well as connection (*to the new system*) of existing water lines, hydrants or services crossed or intercepted by or adjacent to the new waterlines, at locations as required by the City Engineer and Public Works Director (*see PWDS also 1.6.e*).
 - 2) This shall include the extension of water mains in easements across the property to adjoining properties and across the street frontage of the property to adjoining properties when the main is located in the street right-of-way.

This shall also include extension to the far side of streets fronting or adjacent to the development as required to avoid work within or under these streets in the future.

Additional offsite extensions may be required at the direction of the City as required to provide required fire protection redundancy looping as applicable (*see PWDS 5.11*).
 - 3) This shall include waterlines that are oversized to provide capacity for required

fire flows, or as required to meet the minimum sizes required by the PWDS, or by the applicable water master plan, whichever is larger (*see also PWDS 1.6.h*).

- 4) In general, water distribution systems should be designed for maximum development of the service area with recognition of possible urban renewal, industrial expansion, etc.

5.10 WATER SYSTEM CAPACITY

a. General:

- 1) Waterlines shall be provided as required to meet the minimum sizes required by the PWDS or by the applicable water master plan, or as required to provide the required fire flows, whichever is larger (*see also PWDS 1.6.h*). In areas not addressed in the Water Master Plan, design capacities shall be determined by consideration of the following factors and assumptions:
 - a) Area to be serviced, both immediate and adjacent.
 - b) Current and projected population within the areas to be served.
 - c) Current and projected land use within the areas to be served.
 - d) Commercial, industrial, or institutional users to be served.
 - e) Changes in any of the above factors which are likely to occur within a foreseeable time period.
- 2) In the absence of consumption data or other reliable information, the following factors may be assumed:
 - a) Peak hour demands as follows:
 - (1) 5 gpm per single family residential
 - (2) 2.5 gpm per dwelling unit for multiple family residential
 - (3) 5,000 gal/ac/day for commercial development
 - (4) 10,000 gal/ac/day for industrial development
 - b) Demand for unique commercial installations, industrial users, PUD's, multiple and institutional developments shall be calculated on an individual basis.

b. Fire Flow Requirements

- 1) Unless otherwise approved or required by the City Engineer and the local Fire Code Official or Building Official, the water system shall be designed to convey minimum fire flows as follows:

MINIMUM FIRE FLOW REQUIREMENTS**		
<u>Location/Land Use Zoning Designation</u>	<u>Fire Flow (gpm)</u>	<u>Duration (hours)</u>
Residential	R-1	1,000
	R-2	1,500
	R-3	2,000
Commercial Residential CR	2,500	3
Public (Schools & Institutions)	4,000	4
Commercial/Industrial (C, I)		
New Facilities	3,250	3
Existing Facilities	up to 4,000	4
<p>** --These values are general planning values only, and do not supersede or take the place of Oregon Fire Code (OFC) (<i>summarized in OFC Appendix B</i>) or OBC fire flow requirements. --Reductions may be allowed by the Fire Code Official for commercial/industrial/public/multi-family buildings with fire sprinkler systems. --Higher values may be necessary based on the OFC, Fire Code Official, Oregon building codes or ISO requirements.</p>		

- 2) Minimum Fire Flow Requirements. In all cases, all new fire hydrants shall be capable of delivering a minimum of 1,000 gpm at 20 psi residual system pressure (*1,500 gpm min for commercial/industrial/public/multi-family buildings with fire sprinkler systems, per OFC Table B105.2, note b*).

This requirement will apply independently to each phase of multi-phase projects.

- 3) City Staff to be Present at Any Fire Flow Tests. In all cases, hydrant flow tests shall be performed with Public Works staff present unless otherwise approved in writing by the Public Works Director.

5.11 LOOPING

- a. The distribution system mains shall be looped at all possible locations.
- b. All water lines shall be looped and valved such that the removal of any single line segment from service will not result in more than one fire hydrant being taken out of service.

- c. The installation of permanent dead-end mains upon which fire protection depends and areas of large demands on single mains will not be permitted.

5.12 BLOWOFFS

- a. All dead-end mains shall terminate with a blowoff assembly or a fire hydrant.
- b. Permanent dead-ends shall have a permanent blow-off assembly and a permanent thrust restraint system. Permanent blowoffs in cul-de-sacs shall be located in front of the curb within five (5) feet from the curb face.
- c. Mains which can conceivably be extended at some later date shall have a mainline valve (*same size as mainline*) in front of the blowoff assembly, and a thrust restraint system which allows the mainline valve to be connected to without taking the line out of service.
- d. Blowoffs shall be sized to ensure that the water mains can be flushed at a minimum velocity of 2½ feet per second in accordance with AWWA C-650. The following table may be used as a minimum guideline assuming 40 psi minimum residual system pressure under flushing conditions.

MAINLINE BLOWOFF SIZES	
Water Main Diameter	Minimum Blowoff Diameter
6 and 8-inch	2-inch
10 and 12-inch	4-inch
>12	As required

- e. The design engineer shall submit calculations showing that these flushing velocities can be satisfied.
- f. Temporary blowoffs larger than 2-inches in diameter shall have a valve conforming to the requirements contained herein for mainline valves.
- g. Temporary blowoffs, where required for cleaning new water mains, shall be located at the lower end of the line to be flushed whenever possible.

5.13 MINIMUM DEPTH

- a. The standard minimum cover over buried water mains within the street right-of-way or easements shall be thirty six (36) inches from the finished grade, except that a minimum of 40 inches cover shall be required for waterlines in fill slopes.

- b. Finish grade shall normally be determined as follows:

FINISH GRADE	
Mainline Location	Reference Finish Grade
Waterline under sidewalk in right-of-way	Top of curb
Waterline in front of curb	Gutter
Waterline in cut slope (<i>ie. waterline located behind and parallel with curb/sidewalk</i>)	Top of curb (<i>ie. cover depth measured from top of curb grade</i>)
Waterline in cut slope other than parallel with curblines	Perpendicular from pipe to surface
Fill slopes	Perpendicular from pipe to surface
Easement	Finish grade at pipe centerline

- c. Where the waterline is located in the cut side slope, in an undeveloped right-of-way, or along a roadway developed at less than ultimate width (*including sidewalks*), the waterline shall be placed at a depth sufficient to ensure that 36-inches of cover is maintained at the time of final construction of the roadway.

5.14 MINIMUM MAINLINE SIZE

- a. Minimum sizes for water mains shall be as follows, or as required to meet the minimum sizes shown in the applicable water master plan, or as required to provide the required fire flows, whichever is larger (*see also PWDS 1.6.h*):

MAINLINE SIZE REQUIREMENTS	
Minimum Diameter	Type of Mainline
6-inch	Public lines in cul-de-sacs which cannot be looped in the future and which are beyond the fire hydrant envelope of 250 feet to the furthest point on any existing or future structure. Private fire line supplying either a single fire hydrant or a building fire suppression system. Looping of private fire lines which supply hydrants will be required.
8-inch	Minimum size water main for the public water system. Looping back into the distribution grid shall be at intervals as required by the City, but shall generally not exceed ± 600 feet.
8-inch	Public water distribution mains, and permanently dead-end mains supplying fire hydrants with a required fire flow of 1,500 gpm or less.
10-inch & Larger	As required for transmission mains, distribution mains in industrial subdivisions, and fire lines supplying more than 1,500 gpm.

5.15 WATERLINE ALIGNMENT AND LOCATION

a. **General**

- 1) Water lines shall generally be parallel to the right-of-way or easement wherein they lie.
- 2) Unless otherwise required by the City Engineer, water lines shall generally be located on the south and west sides of the right-of-way wherein they lie, or on the high side of the right-of-way for hill side streets.
- 3) Retaining walls shall be offset a minimum of 10 feet from any parallel public water mainline.

b. **Waterline Location in Relation to Sanitary Sewer Lines and Other Utilities**

- 1) **Horizontal Separation.** Water mainlines (*including water service lines within the ROW or City easements*) shall be separated from all other public, private or franchise utilities by a minimum of 5 feet clear unless otherwise approved in writing by the Public Works Director and the City Engineer, but in all cases a

minimum of 3 foot clear separation shall be provided.

See PWDS 1.5.c for reference to reduced separation outside of public ROW or City easements.

- 2) Water/Sewer Horizontal Separation. Water mainlines or water service lines shall generally be separated from sanitary sewer mainlines or sanitary sewer service lines by a minimum of 10 feet unless otherwise approved in writing by the Public Works Director and the City Engineer. In no case shall the separation be less than 5 feet or as required by OAR 333-061 based on the actual vertical separation provided.
- 3) General Vertical Separation. See PWDS 1.5.c for general vertical separation requirements at crossing. See below for separation requirement from sanitary sewers.
 - a) Sanitary Sewer Main Crossings. Where a water mainline crosses below or within 18-inches vertical separation above a sanitary sewer main or sewer service lateral, one full length of waterline pipe shall be centered at point of the sewer crossing (*shown & noted on the waterline plan & profile*).

c. **Waterline Location in Right-of-Ways**

- 1) Unless otherwise approved by the City Engineer and Public Works Director, water mainlines shall generally be located in the street right-of-way along general alignments shown in the City standard details.

Public water mainlines shall be offset a minimum of 6 feet from any adjacent property line or right-of-way line.

- 2) The distance between the mainline and the curb shall vary as little as possible.
- 3) Curved Street Alignments. On curved streets and with City approval, ductile iron water mains (*where DI is allowed or required*) may be laid on a curve concentric with the street centerline with design deflections less than the manufacturer's specifications and subject to the following based on pipe type and size:
 - a) Allowable DI Pipe Joint Deflection.
 - (1) Design maximum deflections shall not exceed 3° at each push-on joint (*~340' radius based on 18' pipe lengths, or ~380' radius based on 20' pipe lengths*).
 - (2) Design maximum deflections shall not exceed 5° per MJ x MJ fitting 12" & smaller (*ie. 2½° per MJ joint*).
 - (3) Design maximum deflections shall not exceed 3° per MJ x MJ fitting 14" & larger (*ie. 1½° per MJ joint*).

- b) PVC Joint Deflection is Prohibited. Design deflection of PVC push-on joints is not allowed.
- 4) Except as noted above, water mains shall be laid in straight lines between angle points with MJ fittings, as required to avoid conflicts with other utilities.

The angle points and tangent sections shall not be closer than 5 feet from the right-of-way line, nor more than 3 feet in front of the curb face.

d. **Waterline Location in Easements, Easement Widths, Maintenance Access Requirements**

- 1) Mainlines in easements will be allowed only in cases where it is required in order to loop a mainline to avoid a permanent dead end condition, and only after all reasonable attempts to loop the mainlines in a right-of-way have been exhausted.
- 2) Minimum Easement Widths. Unless otherwise specified or authorized by the City, minimum easements widths for water mainlines (*as well as water service lines to meters or water meters located on private property*) shall be fifteen (15) feet for normal depth waterlines (*centered on the waterline*).
 - a) Water mainlines with inside diameters 12-inches or larger will require wider easements (*20' minimum*).
 - b) Wider easements may be required for waterlines with (A) cover depths greater than 5 feet, (B) on steep hillsides, (C) where maintenance access concerns exist (*see d.6 below*), or (D) as determined by the City Engineer and/or Public Works Director.
- 3) Water Mainline Offset within Easements: When waterline in easements are approved by the City, the waterline shall be offset a minimum of 7½ feet from any property line, survey monument or easement boundary, or 1/3 the required easement width where wider easements are required (*rounded up to the nearest foot*).

When water mains in easements are parallel with storm drainage channels, the minimum easement width and minimum required offset shall be measured from the top of the drainage channel bank.
- 4) Easement Limits around Meters, Hydrants, Vaults, etc. The easement shall be sized to provide a minimum of five (5) foot clear on all sides around any meter box/vault, hydrant, ARV, backflow vault or similar structure located on private property.
- 5) Easement locations for public water mainlines serving a PUD, apartment complex or commercial/industrial development shall be in parking lots, private drives or similar open areas which will permit an unobstructed vehicle access for

maintenance by City forces.

- 6) **Waterline, Valve & Meter Maintenance Access Requirements.** Where required by the Public Works Director, public waterline located outside of developed street right-of-ways will require all-weather maintenance access lanes similar to that required for sewers under PWDS 4.15.d (*ie. all-weather maintenance vehicle access lanes [AC, concrete or similarly durable surfaces other than gravel] along mainlines and/or for access to valves, meters, hydrants, or other structures subject to a maintenance agreement, etc.*). Vehicular access gates meeting City standards shall be provided in any fences which cross the easement.

If a public water line in an easement is approved without the required maintenance vehicle access, wider easements may be required at the discretion of the Public Works Director.

- 7) **Prohibited Uses in Easements, Gate Requirements.** City standards require that easements granted to the City shall not be used for any purpose which would interfere with the unrestricted use for water mainline purposes. Under no circumstances shall a building or structure, trees or ornamental landscaping be placed over a water mainline or easement, nor shall any parallel fences or parallel utilities be constructed within the easement (***vehicular access gates acceptable to the City shall be installed in fences which the City allows to be constructed across City easements, and locks on gates so approved shall comply with the requirements of PWDS 1.12.c.***). Prohibited structures shall include decks, as well as footings or overhanging portions of structures located outside the easement.
- 8) **Common Easements, Wider Widths.** Common placement in the easement of water and sewer or storm drain line may be allowed under certain conditions subject to approval by the City Engineer and Public Works Director. Easements wider than the minimum will be required.
- a) Common easements will be reviewed on a case-by-case basis. Separation of utilities must meet City and OHA-DWS requirements.
- b) **Franchise Utility Limitations in City Easements.** Franchise utilities shall not be placed in City utility easements unless approved in writing by the Public Works Director, subject to separation requirements in excess of minimums as dictated by Public Works Director.
- 9) **Public Works Review/Approval Required prior to Recording.** All easements must be furnished to the City Public Works and City Engineer for review and approval prior to recording. All recording costs shall be borne by the Developer.

e. **Waterline Phased Construction**

- 1) Water mains installed by phased construction, which will be extended in the future, shall terminate with a mainline valve, blow off and permanent thrust restraint system which allows the mainline valve to be connected to without taking the line out of service.
- 2) 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.
- 3) The construction plans for each phase shall be capable of standing alone, including provisions for looping and minimum fire flows.

f. **Waterline Location in Relation to Ditches and Drainage Channels**

- 1) Surface water crossings of mains shall be in accordance with OAR 333-061 and the requirements outlined herein. Waterline crossings of ditches, streams or other surface water channels shall be ductile iron pipe unless otherwise approved in writing by the Public Works Director.
- 2) Perpendicular Crossings. Water mains crossing ditches or drainage channels shall be designed to cross as nearly perpendicular to the channel as possible.
- 3) The following surface water crossings will be treated on a case-by-case basis:
 - a) Ditch or drainage channel crossing for pipes of 12-inch diameter and greater.
 - b) River or creek crossings requiring special approval from the Division of State Lands.
- 4) The minimum cover from the bottom of the ditch or drainage channel to the top of pipe shall be a minimum of thirty-six (36) inches unless otherwise approved by the City Engineer, Public Works Director and the OHA-DWS.
- 5) A reinforced concrete scour pad centered on the water line will be required for mains where the potential for erosion exists as determined by the City Engineer and Public Works Director, or where inadequate cover exists or may exist in the future. The size and design of scour pads will be reviewed on a case-by-case basis by the City Engineer (*as a minimum, the concrete thickness & rebar size/spacing shall meet or exceed that specified for reinforced concrete pads over shallow sewers*), and may require stemwalls with spread footing for support of the reinforced concrete scour pad (*ie. spread footing & stemwall on each side of the waterline as directed*).

5.16 VALVES

a. Valve Sizes

- 1) In general, valves shall be the same size as the mains in which they are installed. Reducers for reconnection into existing water mains less than 8-inches in diameter (*or existing mains smaller than the new mainline*) shall be placed between the new valve and the existing line (*ie. the new valves shall be the same size as the larger mainline*).
- 2) Unless otherwise approved or required by the City Engineer, valves shall conform to the following table.

Required Valves by Size and Operating Conditions		
Valve Size	Static Pressure	Valve Style
10-inch and smaller	< 120 psi	Gate Valve
8-inch & 10-inch	≥ 120 psi	Butterfly Valve
12-inch & larger	All pressures	Butterfly Valve

- 3) Valve types and materials shall conform to the requirements of these PWDS and the Standard Construction Specifications.

b. Valve Location

- 1) Distribution system valves shall be located at the tee or cross fitting as nearly as possible, and set in locations where operation of all valves associated with said tee or cross will affect traffic on only one side of any street.
- 2) Number of Valves Required at Tees or Crosses. A water mainline tee-intersection shall be valved on all three branches and a water mainline cross-intersection shall be valved on all four branches, configured as required by the City Engineer and Public Works Director (*this requirement does not apply to fire hydrant tees or service connection tees*).
- 3) In addition, there shall be a sufficient number of valves so located that not more than four (4) and preferable three (3) valves must be operated to affect any one particular shutdown. The spacing of valves shall be such that the length of any one shutdown in high value areas shall not exceed 500 feet nor 800 feet in other areas.
- 4) Valves at Crossings. Hazardous crossings (*ie. creek, railroad, freeway crossings, etc.*) shall be valved on each side of the crossing, or where the waterline pipe is installed in a casing unless otherwise approved by the Public

Works Director and the City Engineer on a case-by-case basis.

- 5) Distribution Branches on Transmission Mains. Unless otherwise required by the Public Works Director and the City Engineer, distribution branches on transmission mains shall be spaced not more than 800 feet apart where practical, AND all branches not being connected shall be valved and plugged.
 - 6) Transmission water mains shall have valves at spacings as required by the City Engineer.
- c. Mainline Tapping Tee & Valve
- 1) A tapping tee & valve to make connection to an existing, in-service line is only allowed in cases where the City determines that water service cannot be interrupted to cut in a tee or cross, and where the additional in-line valve is not needed for system isolation as outlined above.
- d. Water Valve or Fire Hydrant Operation by City Public Works Staff
- 1) City forces shall operate all valves, including fire hydrants, on existing public water mains, on the public side of water meters, or at the connection of fire service lines to public water mains.

5.17 FIRE HYDRANTS

- a. Hydrant Coverage
- 1) Preferred coverage (*unless otherwise approved in writing by the City Engineer and the Fire Code Official*) shall result in maximum hydrant spacing of 500 feet in residential areas, 300 feet in high-value districts including industrial subdivisions, AND no further than 250 feet from the furthest point of any dwelling, business, garage or building (*in addition to specific hydrant location requirements below*).

Hydrant stubs with mainline valves will be required as a minimum in undeveloped areas, at locations as required by Public Works or the City Engineer.

- b. Hydrant Location, Clearance & Availability
- 1) **Hydrants shall be located at corner of each public & private street intersection** where possible, and adjacent to entrance driveways for public, multifamily, commercial or industrial type developments (*unless otherwise approved in writing by the City Engineer and the Fire Code Official*).

Hydrants located at points other than intersections shall be located at the extension of property lines where feasible (*offset as required to avoid conflict*)

with survey monuments per ORS 92.044.7).

- 2) No fire hydrant shall be installed on a main of less than 8-inch diameter unless it is in a looped system of 6-inch mains which are demonstrated to be able to provide the required fire flows with flow velocities under 10 feet/second. The hydrant lead shall be a minimum of 6-inches in diameter.
- 3) Hydrants shall be placed in locations approved by the City Engineer and the Fire Code Official, based on required distance from buildings as summarized above (*and/or required distance from any existing or proposed FDCs*).
- 4) Unless otherwise approved by the City, hydrants shall be placed between the sidewalk and the property line.
- 5) Clearances & Access. No hydrant shall be installed within five (5) feet of an existing utility pole or guy wire nor shall a utility or guy wire be placed within five (5) feet of an existing hydrant.
 - a) Fire Hydrant Access. A minimum 3 foot clear working area shall be maintained around any fire hydrant per OFC 507.5.5, with a maximum grade of 5% within such working area.

Access to and around all fire hydrants shall not require crossing through ditches/swales from the roadway (ie. culverts shall be provided in swales or ditches as necessary to allow for at-grade access)..
 - b) Trimming and/or maintenance of landscaping, shrubs, hedges or other growth as required to provide this required clearance shall be an ongoing responsibility of the owner of the property immediately adjacent to the fire hydrant location.
- 6) Existing or new hydrant availability for a particular property will be determined by the City and Fire Code Official based on both distance and accessibility (*see also OFC C103.1 & C104*).
 - a) Existing hydrants on City streets are generally considered as available to properties on both sides of the street.
 - b) Hydrants along or adjacent to State Highways. For purposes of new development, hydrants on the opposite side of an ODOT highway right-of-way are generally NOT considered to be available, unless specific prior written approval is granted by ODOT (*ie. since the Fire Department would thereby need to lay hose across the highway and restrict traffic during emergencies*).
 - c) Hydrants adjacent to Railroads. Hydrants on the opposite side of railroad tracks are NOT considered to be available.

- d) Hydrants located on or across adjacent properties are not considered available unless fire apparatus access roads (*fire lanes*) extend between properties, and easements are recorded to prevent obstruction of such roads (OFC C104.1).

c. Hydrant Valves

- 1) Each fire hydrant shall have a hydrant valve and valve box at the mainline hydrant tee which will permit removal and repair of the hydrant without shutting down the water main supplying the hydrant.
- 2) Hydrant valves shall be resilient wedge gate valves.
- 3) The hydrant valve shall be connected directly to the mainline tee using a flange joint.
- 4) Far Side Hydrants. If the length of the hydrant lead is greater than 30 feet, an additional gate valve shall be provided within 3 feet of the hydrant, but under no circumstances shall the valve be attached to the hydrant.

d. Hydrant Leads.

- 1) All hydrant leads shall be Class 52 ductile iron, 6" minimum diameter, with retainer glands at both ends.
- 2) Unless specifically approved in writing by Public Works Director for long hydrant leads, all hydrant leads shall consist of a single piece of pipe without joints. Any joints allowed on hydrant leads shall be provided with fully restrained gaskets (*Field-Lok or equal*).
- 3) Unless specifically approved in writing by the Public Works Director due to extraordinary extenuating circumstances, bends in fire hydrant leads are prohibited.
- 4) **Water service taps or fire line service taps on hydrant leads are prohibited.**

Where approved by the City Engineer and Public Works Director on a case-by-case basis, installation of a public waterline across a street in order to accommodate the required separate connections of a far side fire hydrant and a far side service connection (*water service or fire service*) to a common public waterline may be allowed. The cross street waterline pipe shall be 8-inch minimum diameter, or one pipe size larger than the combined service line & hydrant lead sizes, whichever is greater.

Where this configuration is allowed, the public waterline across the street shall remain full size up to the isolation valve marking the boundary between the waterline and the fire hydrant lead and the service line connections.

e. Hydrant Bury & Exposure

- 1) Hydrant bury shall be sufficient to provide a minimum of 36-inches of cover over the hydrant lead. In no case shall the bury be less than the depth of the waterline from which the hydrant is served.
- 2) The hydrant shall be set such that the base of bottom flange bolts are a minimum of 2-inches and a maximum of 6-inches above finish grade following all landscaping and surface restoration.

f. Hydrant Orientation.

- 1) The Contractor shall coordinate and orient the hydrant steamer/pumper port as directed and approved in writing by the local Fire District/Fire Dept.
- 2) Hydrants installed in advance of such coordination and written direction shall be adjusted and reoriented without additional cost to the City.

g. Hydrant Operation & Use

- 1) No person other than Public Works staff shall operate or flow test fire hydrants (*fire flow testing, etc.*) without first obtaining written authorization from the Public Works Director. This hydrant use restriction shall not apply to fire department/fire district staff in the performance of their regular duties.
- 2) City Public Works Staff to Be Present During Testing. All hydrant flow tests shall be performed with Public Works staff present unless otherwise approved by the Public Works Director.
- 3) Hydrant Wrench Required. Opening or operating fire hydrants with any tool other than a standard hydrant wrench designed for that purpose is prohibited.

h. Fire Department Connections (FDC).

- 1) Location & Configuration. Per OFC 912.2, the location and configuration of any FDC shall be as approved by the Fire Code Official, including but not limited to considerations on how fire equipment will be staged to access the site and available hydrants, and how fire & emergency equipment will be staged in order to support access to the building by fire personnel (*including but not limited to being located so that fire apparatus and associated hoses will not obstruct access to the building by other fire apparatus, nor unreasonably obstruct traffic to or around the site or along fronting streets*).
 - a) FDCs shall not be located on frontages with ODOT right-of-ways unless approved in writing by both the Fire Code Official and ODOT prior to submittal of the design (*based on findings which shall include, but may not be limited to, demonstration that there is adequate width to ensure that fire apparatus can access both the FDC and the*

associated fire hydrant without blocking traffic along the ODOT roadway with equipment, hoses, traffic control devices, etc., AND that there is no other feasible alternative location where the FDC can be located).

- b) FDCs shall not be installed at locations which require the Fire Department to cross drainage ditches or swales in order to access the FDC, unless culverts are installed at such crossings (*ie. similar to hydrant crossing requirements*).
- 2) Maximum Distance from FH to FDC. The distance from a fire hydrant to the fire department connection (FDC) shall not exceed 40 feet unless otherwise approved in writing by the Fire Code Official, but in no case shall a distance of greater than 60 feet be allowed.
 - 3) FDC connections/risers and FDC supply lines shall be installed in conformance with provisions of the Oregon Fire Code and applicable NFPA standards (*including but not limited to installation of accessible ball drip valves, cover depths for freeze protection, etc.*), with specific location and configuration subject to approval by the Fire Code Official, with maximum distance from a fire hydrant as specified above.
- i. No Parking Designation at Hydrants and FDCs
 - 1) Parking is prohibited for 10 feet each way from fire hydrants (*ORS 811.550(16)*) or from FDCs, where such parking would block unrestricted access to the hydrant or FDC from the fire apparatus access way.
 - 2) Curbs adjacent to fire hydrants or FDCs shall be painted 10 feet each way per Detail 503. Areas without curbs shall be marked or signed for no parking as approved by the Fire Code Official.

5.18 AIR RELEASE VALVES

a. General

- 1) Provisions for air relief shall be provided at all high points of waterlines. Where possible, location of service taps at high points in the line is preferable to the installation of an air relief valve.
- 2) Where service taps cannot be used, an air release valve shall be permanently installed at high points on all water mains at all location where air can accumulate. An automatic air release valve shall be installed in a meter box or vault located outside of the street or traffic areas (*ie. a location behind curb or sidewalk as approved by the City*), and also at a location where flooding of the meter box or vault will not occur.

- 3) Any ARV installed above grade (*ie. bridge crossings, etc.*) shall protected from freezing with a hotbox insulated enclosure and heat tape/heater, or other approved means.

b. **Air Release Valve Piping**

- 1) The open end of an air release pipe from automatic valves shall extend to the top of the meter box or vault at least twelve inches above grade and provided with a screened, downward facing tee vent. Grade shall mean the existing ground elevation adjoining the meter box or vault (*see also Detail 518*).

5.19 WATER SERVICE LINES & METER LOCATION REQUIREMENTS

a. **General**

- 1) Water Service Installation.
 - a) 1½" & Smaller Water Services on New Water Mains. For water services connection to new mainlines, the tap, corporation stop, service line, meter box and all piping & fittings within the meter box must be installed by the contractor.
 - b) 2" & Larger Water Services. Unless otherwise required or approved by Public Works, water services 2-inches and larger shall be installed by a City approved contractor retained by the developer, under the on-site inspection and subject to the approval of Public Works.
 - c) Water Service Replacement. Unless otherwise approved in writing by the Public Works Director, existing water service pipe (*from the mainline to the meter location*) or meter boxes which do not meet current City material standards shall be replaced (*by the applicant at their expense, to current City standards*) in conjunction with new building construction or in conjunction with change of use on the property, or in conjunction with new waterline construction.
- 2) Booster Pumps. The use of private pumps on the public portion of a water service line (*ie. between the mainline and the meter*) shall be prohibited.

Booster pumps installed on private property (*ie. beyond the water meter*), where required provide adequate pressure to a lot or property which is located above the pressure level of the supply main, shall require written authorization by the Public Works Director, subject to the installation of a premise isolation backflow device meeting City and state standards, located between the water meter and the booster pump.
- 3) Easement Requirement. An easement shall be recorded for any water service line which encroaches on or crosses any legal lot other than one being served.

- 4) Separate City Water Meters for Specific Uses.
- a) Meter for Each Legal Lot. Each legal lot of record shall be provided with at least one separate water service line connected to the public or approved private water main. Combined water service lines will be permitted only when the property cannot legally be further divided. An example of this is a residential lot with a house and a detached garage, shop or ADU with plumbing fixtures.
 - b) Duplex & Triplex. Separate water services and separate meters shall be installed to serve each side of duplex lots, and each unit of triplex residential buildings unless otherwise approved by Public Works Director (*DMC 8.2.16.E*).
 - c) Condominiums, Detached Single Family Dwellings & Detached ADUs. Separate water services and separate meters shall be installed to serve each unit of condominiums (*or existing buildings proposed to be condominiumized*) or to serve each unit of developments with separate detached dwelling units (*except where otherwise approved by City for RV parks – DMC 8.2.16.5*) or single family lots with separate detached accessory dwelling units- ADUs.
 - d) Apartments. Four (4) or more attached units on a single legal lot of record will be considered as a multi-family apartment and served from a City common water meter, unless otherwise approved by the Public Works Director.
 - e) Separate Commercial Buildings. Unless otherwise approved by the Public Works Director on a case-by-case basis, each building in a multi-building commercial development on a common property shall be provided with a separate water meter. Separate commercial or industrial uses located in a single common building (*under a common ownership*) may have a single or multiple water meters.
 - f) Mixed Use Commercial/Residential. Mixed use commercial / residential buildings may be served from a common water meter, is specifically approved by the Public Works Director.
 - g) Sub-Meters to be Private. Any submeters installed on the private side of a City water meter for water bill allocation shall be private and located on private property, and shall be the sole responsibility of the property owner for installation, maintenance, reading, etc.
- 5) Water Services along Flagstem & Common Use Driveways. Where water service lines beyond the meter are required or shown along flagstem or common use driveways (*or which cross property other than that being served*), the pipe shall be extended to the end of the driveway or to the boundary of the lot being served (*whichever is farther*) in conjunction with the

development infrastructure construction. The end of the service line shall be marked with a 2x4 post wired to the pipe stub, extending 18" above grade, with the toning wire stapled to the top of the marker post.

- 6) Additional Meter Requirements. Additional water service lines must be stubbed into the property lines sufficient to serve all residential parcels which can be further partitioned in the future where such future partition would require that the streets be cut to install such services, or where the service line must cross intervening property to provide such future service.
- 7) Curb Stamping. Where water service lines are connected to water mainlines in the street, the top of curb and the gutter pan shall be stamped at the point of the service crossing as required by the City standard details and standard notes.
- 8) Perpendicular Water Services. Unless otherwise approved in writing by the City Engineer and the Public Works Director on a case-by-case basis, water service lines shall be installed from the mainline to the property line perpendicular to the street centerline. Permanent installation of water service lines with the right-of-way is generally prohibited, except where extenuating circumstances exist which meet the variance criteria.
- 9) Private Pressure Reducing Valves. Private pressure reducing valves (PRV) may be required by Public Works Director in certain areas (*to be installed on the private side of water meters*). The installation, maintenance and repairs of such devices shall be entirely the responsibility of the property owner.
- 10) Protection of Water Meters & Water Meter Boxes/Vaults. While water meters and water meter boxes/vaults are owned by the City, the responsibility for protection of said water meter and associated meter box/vault shall remain the joint responsibility of the customer and/or the owner of the property served by the meter. The customer/property owner shall be liable for damage to the meter, meter box (*or other equipment owned by the City*) due to failure to adequately protect it from damage, including but not limited to damage from vehicular traffic, parking, etc. (*DMC 8.2.22*).

b. **Water Service Pipe Sizes**

- 1) Standard service line sizes are 1-inch, 1½-inch, 2-inch, 4-inch, 6-inch and 8-inch (*4" service line required for 3" meters*). Service lines will be reviewed for effects on the distribution system and shall not be greater in size than the distribution main.

MINIMUM WATER SERVICE PIPE SIZE	
Type of Service	Minimum Service Size
Single residential service ¹	1-inch
Triple residential service (triplexes only)	1½-inch
Commercial/Industrial/Public/Multi-Family type Service ²	1½" minimum
Irrigation Service	1-inch minimum
Notes: ¹ . The next larger service size may be required for residential lots large enough to be partitioned into additional lots without a water main extension. ² . Multifamily, commercial or industrial type water meter size smaller than 1½" requires prior approval by the City Engineer & Public Works Director (<i>it should be noted that, with approval from Public Works Director, reducers can be installed at the meter setter location as applicable if smaller meters are desired, and where maximum demand flows are demonstrated to be within operating limits of the smaller meter</i>).	

- 2) Water service piping from the main to the meter shall be equal to or greater than the meter size. See documentation required in water meter sizing subsection below.
- 3) Commercial, public, industrial or multi-family type water services shall not be smaller than 1½-inch (*reducers may be installed at the meter setter location to accommodate a smaller meter*).

For new streets or streets being cut for service installation, far side commercial, public, industrial or multi-family services 1½-inches or smaller diameter shall be installed in a 4-inch minimum size PVC sleeve. For 2-inch services, the 4-inch PVC sleeve may be waived by the Public Works Director on a case-by-case basis.

- 4) For other than single family residential use, or for commercial, public, industrial or multi-family type meters, or for 1½-inch and larger meters, applicable calculations must be submitted with the expected flow requirements and proposed usage, as summarized under water meter sizing criteria below.
- 5) Private Water Service Pipe Size Limits (beyond meter). Typically, the water service line on the private side of the meter may not be larger than one nominal pipe size greater than the meter size. Larger sizes shall be approved by Public Works prior to installation, to ensure that water usage and flowrates do not exceed the recommendations for the meter being provided.

c. **Tapping requirements**

1) Tapping requirements for water service lines shall be as outlined below.

WATER SERVICE TAPPING REQUIREMENTS		
Service Size	Mainline Type	Tapping Requirements
1"	All pipe types	Service Saddle
1½"	All pipe types	Mainline tee (<i>or tapping saddle</i>) with valve per details
2" & larger	All pipe types	Mainline tee (<i>or tapping saddle</i>) with valve per details

d. **Water Service Location**

1) **Domestic & Irrigation Services**

- a) The service lines shall extend from the main to the meter location shown on the City standard details. An angle meter stop and meter box shall be located at the termination of the service line.
- b) The meter stop shall be located such that the front of the meter box is the distance behind the curb or sidewalk as shown on the City standard details.
- c) In general, individual service connections shall terminate in front of the property to be served. Double services shall be located on each side of a common side property line.
- d) Domestic or irrigation service lines shall not be connected to fire protection services, including hydrant leads.

e. **Fire Service Configuration & Design**

- 1) The fire service line shall be considered to be from the isolation valve at the public mainline connection to the building.
 - a) **Service taps of any kind on fire service lines are prohibited.** See PWDS 5.17.d for criteria required if a public waterline is proposed across a street in order to accommodate the requirement for separate connections of far side fire hydrant and a far side service connection.
 - b) **Fire Service Maintenance Responsibility.** Per PWDS 5.7, the entire portion of the fire protection service from the isolation valve at the public mainline connection to the building shall be the sole responsibility of the property owner for maintenance and/or repair.

- 2) Fire Service Backflow Prevention. A backflow prevention assembly (including a detector loop with City approved detector meter & read head, in addition to the City/State required detector loop backflow assembly) shall be placed on fire service lines at a location acceptable to the City (located on private property outside of the public right-of-way or City easement, either in a vault or inside the building).
 - a) Detector Loop Meter. For each DCDA or RPDA, the Contractor is responsible for coordinating with Public Works as necessary in order to obtain, provide and install an approved water meter on the detector loop which includes transmitter accessories compatible with the City's existing meter reading system.
- 3) Fire Service Design. Plans for fire service lines shall meet the requirements outlined in PWDS Division 1, and shall be stamped by a licensed Civil Engineer. The portion of the fire service within the right-of-way or within utility easements to the City shall conform with PWDS 5.8.g,11 (ie. *Cl 52 DI pipe*), and the remainder (on private property) shall conform with the Oregon Fire Code and referenced standards, and shall be acceptable to the Fire Code Official.
- 4) Drawings for fire services (ie. those not included as part of a larger drawing set that already includes the information below) shall include cover sheet (with information per PWDS 1.11) & sheet index, vicinity map, scaled & dimensioned site plan showing adjoining street name, width, curb and property line, location of existing water line (referenced to the property line), existing hydrant locations and the distance to property pins where the service crosses the property line (offset as required to avoid conflict with survey monuments per ORS 92.044.7), location of proposed backflow assembly, proposed FDC location and location of & distance to fire hydrant proposed to serve the FDC (along an accessible route without obstructions acceptable to the Fire Code official), and shall include all applicable details required for construction of the fire service and appurtenances, including the location and style of meter on the backflow detector loop.

Profile views of new fire services or FDC service lines shall be provided where required by the City Engineer or Public Works Director in order to illustrate vertical alignments (*high points/low points*) or vertical clearances from existing utilities, adequate cover depth at ditch/swale crossings, etc.

- 5) Forward Flow Test Port & Drain (see also Detail 559 or Detail 563).
 - a) A "Forward Flow Test Port" shall be provided for all fire service lines (on the fire sprinkler side of the DCDA assembly), and shall be installed in the DCDA vault per City details for exterior DCDA assemblies or adjacent to the DCDA for those installed inside a building (unless an alternate permanent "Forward Flow Test Port"

location is approved in writing by Public Works and the Fire Code official), or if a private fire hydrant downstream of the DCDA is designated as the required "Forward Flow Test Port".

- b) The fire service design engineer is responsible for coordinating with the fire sprinkler system designer/installer to verify the flowrate required for the "Forward Flow Test" of the backflow device, and the fire sprinkler system installer shall coordinate to ensure that all connections, hose & flow measurement equipment (*Hose Monster or equal*) is provided as required to conduct the acceptance "Forward Flow Test" as required by NFPA 13.10.10.2.5.1.
- c) All components of the Forward Flow Test Port (*including connections, valves, etc., but excluding the fire hoses & flow measurement equipment*) shall remain in place to allow subsequent "Forward Flow Tests" to be conducted without any system modifications (*ie. the annual flow tests as required per NFPA 25.13.6.2.1*).
- d) If the Forward Flow Test Port is installed inside a building, drains adequate to handle the full test flows shall be provided, unless provisions are included to direct the test flows to the exterior of the building in a location which will not cause damage to public or private property.

5.20 WATER METERS

a. General

- 1) Except as otherwise required, all water meters within the service area of the City of Dayton will be furnished and installed by City forces at the request and expense of the customer. See PWDS 5.19.a for service tapping & water service installation responsibilities.
- 2) Unless otherwise required or approved by Public Works, all meters 1½-inches and larger shall be installed by a contractor retained by the developer, under the on-site inspection and subject to the approval of Public Works Director.
- 3) Calibration Testing for Larger Meters. All meters 3-inch and larger shall be calibration tested after installation and prior to being placed in service. Testing shall be done by a qualified and trained water meter tester at the developer's expense. All test results shall be submitted to Public Works Director for review and approval.
- 4) A backflow preventer meeting City & State standards shall be provided and installed by the Contractor at locations acceptable to Public Works Director.

Any required backflow devices shall be tested and approved by the City

(including submittal of test results to Public Works) prior to being placed in service.

b. **Water Meter Sizing.**

- 1) **Meter Sizing Documentation Required.** For other than single family residential use, or for commercial/industrial/public/multi-family type meters, or for 1½-inch and larger meters, the development team must submit calculations, documentation and drawings as applicable with the expected flow requirements and proposed usage, including a complete listing of fixture unit counts for all plumbing fixtures to be served by the proposed meter (*fixture unit summary is to be included on the civil drawings per requirements under PWDS 1.11*).
- 2) Fixture unit equivalents and demand curves (*used in determining the design flow rates to size water meters for other than separate single family uses*) shall be established in accordance with the Oregon Plumbing Specialty Code (OPSC table 610.3 & Charts A103.1(1) & A103.1(2)).

The size of water meter required shall be based on standards determined by the Public Works Director (*based on OPSC fixture unit demand curves unless use of peak design demand flow is required for industrial type uses*), and will be based on meter sizing to limit velocities as summarized below.

- a) **Maximum Velocity Through Meter.** Generally, design velocities (*based on fixture unit equivalents and flowrates from demand curves as summarized above*) greater than 10 feet per second shall **NOT** be allowed through water meters (*see also OPSC 610.12 & A107.1*).
- 3) City meter sizing criteria includes factors to minimize excessive velocities in the water system, including velocities through meters and water service lines (*in order to reduce the risk of water hammer induced pipe breakages on the public and/or private side of the meter, and to maximize the useful lifespan of the water meters installed*).

Unless otherwise determined by the Public Works Director, default meter sizing (*and associated SDC charges*) will be based on the “High-Normal Flow Rate” (*for Compound Class II meters for 2” & larger meters, or Positive Displacement/Multi-Jet style for smaller meters*) in Table 6-1 of AWWA M22 3rd Edition (*Sizing Water Service Lines and Meters*) published by the American Water Works Association (AWWA).

- a) **Meter Sizing for Flushometer Valves.** Sizing for systems with flushometer valves shall be in conformance with cumulative fixture unit counts listed on OPSC Table 610.10. In general, meters on systems serving a flushometer valve for a toilet or a urinal shall not be less than 1½-inch diameter (*Note: larger than 1½-inch meter size is*

typically required where multiple flushometer valve fixtures are served through a single meter).

- 4) Sizing based on turbine style water meters (*or on-site water storage with a booster pump*) will only be allowed where approved by the Public Works Director on a case-by-case basis (*at his/her sole discretion*), where projected flow patterns support the use of a turbine meter (*or smaller meter due to on-site water storage with a booster pump*).
 - a) In cases where the Public Works Director allows the use of a turbine meter in place of a standard meter, or allows a smaller meter due to on-site water storage and a booster pump, any reduction in meter size (*due to the use of such turbine meter or onsite storage with booster pump*) will not result in a reduction of applicable SDC fees, unless otherwise approved in writing by the City Council.
 - b) If turbine meters are allowed (*or a smaller meter due to on-site water storage with a booster pump*), and changes in future flow patterns result in reduced meter accuracy, the Public Works Director may require that the turbine meter (*or smaller meter*) be changed to a standard meter, at the customer's expense.

c. **Water Meter Location, Configuration, etc.**

1) General

- a) Location & Offset from Property Lines. Meters shall be located at the termination of the City service line, at locations as shown on the City standard details (*including minimum clear offset from property lines not less than 1 foot for standard meter boxes, 5 feet for water meters in vaults*).

Unless otherwise approved by the Public Works Director, meters shall be located within the right-of-way or easement containing the water mainline (*see PWDS 5.15.d.4 for easement limits around water meters located outside of public right-of-ways*).

- b) Meter Location Approval Required. All meter locations shall be approved by the Public Works Director (*ie. based on access & maintenance considerations, and to minimize the length of service line between the mainline and meter to the extent feasible*).

Per PWDS 5.15.d, approval of any meter installed outside of the public right-of-way shall require that an all-weather maintenance access lane be provided (*by the developer or property owner*) from a public roadway to each such water meter located outside of the improved right-of-way, including easement access rights to the City along such access lanes (*whether across the property being served or other properties*).

- (1) Unless otherwise approved by the Public Works Director on a case-by-case basis, meter boxes shall be located outside of driveways or other areas subject to vehicular traffic.

Approval by the City for meters and meters boxes set in driveways or areas subject to vehicular traffic shall be contingent upon the Developer, builder or property owner providing a traffic rated meter box, including installation of a concrete collar around the box per City standards in traffic or gravel areas (*concrete is required both to provide lateral support for the meter box and the prevent gravel from covering the box lid*).

After initial installation, the property owner shall be responsible to protect the meter box and meter from damage. Damaged meter boxes (*or concrete collars where required*) shall be repaired and/or replaced as directed by the City, at the property owner's expense.

- c) Meters to be Outside of Buildings. Water meters (*excluding detector loop meters on fire service lines where DCDA or RPDA assemblies are approved to be installed inside of a building*) shall be located outside of buildings being served, at a location approved by the Public Works Director (*DMC 8.2.16.G*).
- d) Detector Meters Required on Fire Service Backflow Assembly Detector Loops. Meters per City standards are required on fire service detector loops, and shall be installed at accessible locations acceptable to the Public Works Director, and reader heads shall be provided as required to allow the meter to be read without entering the building.
- e) Easement around Meter Box/Vault. A public utility and access easement to the City shall be provided to and around any meter boxes or meter vaults set on private property. The easement shall be sized to provide a minimum of five (5) foot clear around the meter box or vault on all sides.

2) 3/4-inch through 2-inch Meters

- a) In the right-of-way in a location that allows for easy reading and maintenance, at the location specified herein or shown on the City standard details.

3) 3 Inch and Larger Meter:

- a) Meter Location & Access. On private property adjacent to the public right-of-way to allow reading and maintenance.

The meter vault must be accessible with a crane truck to within ten feet of the installation with a ten foot vertical clearance.

- b) The meter, vault and piping are to be protected from freezing, vandals and vehicles.
- c) Grading Around Meter Vault. The area around the vault must be sloped in such a manner to prevent storm water from ponding over or running into the vault.
- d) Clearance Around Meter Vault. A minimum three foot clear space must be provided around the vault to provide ample working space for maintenance.
- e) Remote Readout. All 3-inch and larger meters shall be provided with a remote readout approved by Public Works Director which is located such that it can be read without entering the meter vault.
- f) Sump Pump & Power to Meter Vault. A sump pump shall be installed and maintained in the meter vault (*of all meters larger than 2-inch*) by the property owner, discharging to a storm drain or other location approved by Public Works Director. Owner of the property being served shall be responsible for all permits & installation costs associated with providing, installing and connecting conduit(s) and power to the meter vault for the sump pump and/or freeze protection, and for the ongoing power costs.
- (1) Where conduit(s) connect to building basements, and where conduits are installed flat or slope toward the building, the conduits shall be swept up to an above grade junction box mounted on the exterior wall of the building, to avoid the potential for groundwater drainage into the basement if the buried conduit is cracked or broken in the future.
- g) Lockable Bypass. The configuration of the lockable bypass shall be acceptable to Public Works Director.

- 4) The meter, with approval by the City, may be located in the same vault with a backflow prevention device, provided a completed dimensioned design is submitted with a request for variance.

d. **Meter Boxes**

- 1) Meter boxes shall be provided by the Developer for each water service and meter location. Double set meters (*2 meters in 1 box*) are not allowed.
- 2) Meter boxes for water meters 2" & smaller shall be set level to finish grade (*vaults for larger meters shall be set to grades as shown by City standard details*). The Developer, builder or property owner shall be responsible for setting meter boxes and services to finish grade prior to initial installation and approval of water meters by the City.
- 3) Meter boxes that do not provide all required clearances and spacing so as to allow the City to install a standard meter without removing the box, will be required to be reset or replaced by the developer or builder (*at their sole expense*), prior to installation of the meter by the City.

5.21 PRIVATE WATER SYSTEMS

- a. General design considerations for private water systems shall conform to requirements set forth by the OHA-DWS, by the Oregon Plumbing Specialty Code (OPSC) (*Chapter 10*), and these PWDS.
- b. All public water mains within private developments shall be in public right-of-way or exclusive easements to the City of Dayton and shall conform to these PWDS. Each connection of the private water system to the City system shall be through an approved backflow prevention assembly and master meter.
- c. Requirements for capacity, materials, looping, valves, fire protection, service lines and meters shall also be applicable to design within PUD areas.
- d. The resale of water without written approval of the City shall be prohibited. Written authorization from the City shall be required for each service connection and for any sale of water.

5.22 BACKFLOW PREVENTION

a. **General**

- 1) All backflow assemblies shall be testable, and shall be tested by a certified backflow testing person or organization, with copies of the test results submitted to Public Works, prior to being placed in service.

- 2) An approved backflow prevention assembly (*with an approved metering system where applicable*) shall be required for each use in the following instances:
 - a) As determined by the City Cross Connection Specialist and OHA-DWS requirements.
 - b) When a private line must be extended from or looped between two (2) or more City mains in order to obtain the required flow and the resultant loop is no benefit to the City grid system.
 - c) On all fire services, which shall also include a detector loop & detector meter style & configuration as approved by Public Works Director (*regardless of whether or not the fire service double check assembly is located inside or outside of a building*).
 - d) On any private water lines serving multiple buildings or parcels or on a private distribution system attached to the City's distribution system (*with or without a master meter*).
 - e) When an auxiliary water supply exists on the property being served, including but not limited to a domestic or irrigation well, or an irrigation system supplied from a surface water source (*see OAR 333-061 Table 42*).
 - f) Where a booster pump or pressure tank exists on the service line to the property being served, or on any extensions of (*or connections to*) the service line serving the property.
- 3) An approved reduced pressure (RP) backflow prevention assembly shall be required for service connections in high hazard areas as determined by the City Engineer and Public Works Director or City Cross Connection Specialist.
 - a) RP backflow devices shall be provided with drains per OHA-DWS standards.
 - b) An RP backflow prevention assembly shall be installed with any opening set a minimum of 1 foot above the FEMA 100 year flood level.
- 4) The backflow assemblies must meet the City approved assembly standards, which standards are taken from the current approved list of assemblies maintained by the OHA-DWS.
- 5) Unless installed indoors or in weather proof above grade enclosures, all backflow assemblies shall be installed in a box or vault approved by Public Works Director. Sump pumps per City standard details (*style adequate to keep water below the vault floor*) shall be provided for all double check assemblies installed in vaults (*3" & larger size*).

Owner of the property being served shall be responsible for all permits & installation costs associated with providing, installing and connecting conduit(s) and power for required sump pumps and/or freeze protection, and for the ongoing power costs.

Conduits required for connecting OS&Y valve tamper switches to fire alarm control unit shall also be the responsibility of the owner of the property being served.

- a) Where conduits connect to building basements, and where conduits are installed flat or slope toward the building, the conduits shall be swept up to an above grade junction box mounted on the exterior wall of the building, to avoid the potential for groundwater drainage into the basement if the buried conduit is cracked or broken in the future.

b. Backflow Location

- 1) The approved backflow prevention assembly shall be installed on the property being served in a place accessible for City inspection and for testing and located as follows:
 - a) Before any branch, immediately downstream of the meter; or
 - b) If not metered, at the property line; or
 - c) If in the building, before the first branch or hazard being controlled or as determined by the City Cross Connection Specialist.
- 2) If installed outside the building being served, it shall be placed at or adjacent to the property line or easement line in a vault or structure in accordance with the manufacturer's recommendations and as approved by the Public Works Director. Vaults must have a sump and be watertight.
 - a) Easement around Box/Vault. A public utility and access easement to the City shall be provided to and around any backflow assembly set on private property (*ie. when installed outside of the building being served*). The easement shall be sized to provide a minimum of five (5) foot clear around the box or vault on all sides.

c. Backflow Thermal Expansion Issues.

- 1) As noted under OAR 333-061-0070(2.b), "Thermal Expansion' means the pressure increase due to a rise in water temperature that occurs in water piping systems when such systems become "closed" by the installation of a backflow prevention assembly or other means, and will not allow for expansion beyond that point of installation."

- 2) It is the responsibility of the property owner and/or water user to provide a thermal expansion tank or other means approved by the Oregon Plumbing Specialty Code (OPSC) to address thermal expansion concerns in the private water system piping downstream of any backflow device or pressure regulator where applicable (*see OPSC 608.2&3 for expansion tank requirements*).
- 3) This section shall be considered to be written notice to the premise owner and water user of these thermal expansion concerns, and notice of the responsibility of the premise owner and/or water user to address these concerns (*see OAR 333-061-0070(9.b.A.iii)*).

5.23 UNDERGROUND WARNING TAPE & TONING / TRACER WIRE

- a. Detectable or non-detectable acid and alkali resistant safety warning tape shall be provided along all mainlines not located under sidewalks or paved portions of public streets.
- b. Underground warning tape shall be placed a minimum of 12-inches and a maximum of 18-inches below the finish ground surface, and shall be continuous the entire length of the mainline as specified.
- c. All water pipe (*both public lines and private lines within right-of-way or easements*) shall have an electrically conductive tracer wire, 12 gauge minimum size single strand insulated copper with blue sheathing, installed in the trench for the purpose of locating the pipe in the future. The tracer wire shall run the full length of the installed pipe, with each end extended to within 12-inches of the surface through a valve box or meter box.

5.24 MAINLINE BORED CROSSINGS

- a. Casing size shall be adequate to permit proper construction of the carrier pipe to the required lines and grades. Carrier pipe installed inside steel bore casings shall be as specified herein.
- b. All bore crossings shall be provided with casing spacers and end seals. Casing spacer configuration shall conform to the manufacturer's recommendations, but in no case shall less than 3 spacers per length of pipe be used.
- c. In order to prevent over-belling of PVC or other flexible pipe while installing it through the casing, provide a method for restricting movement between the assembled bell and spigot conforming with the manufacturer's recommendations.
- d. The design of the bore crossing shall include the following as a minimum:
 - 1) Casing and carrier pipe materials and dimensions, including outside bell diameters of the carrier pipe.

- 2) Details for any part of the system which must be changed as a result of the boring operation (*manhole, headwall, etc.*).
- 3) Bore and receiving pit backfill material and compaction requirements.

