

Backflow Assembly Installation Requirements

1. Premises-Isolation assemblies (those that directly protect the public water supply) must be installed on private property at the property line (service connection/point-of-delivery) on the centerline of the city water service, as it runs perpendicular from the right-of-way (R.O.W.). Installations must be compliant with all applicable Title 21 and Title 28 criteria, and those stated herein. The supply side of premises-isolation assemblies must be plumbed with potable water piping and fittings meeting current NSF/ANSI standards for lead content. Premises-Isolation assemblies approved to be installed inside buildings must be installed on the riser/supply pipe where the water service enters the open space and/or exits a water meter vault. Other elevation criteria as stated herein will apply. An alternate assembly location may only be considered for retrofit applications and excludes new construction. Alternate locations may only be approved by the Water Bureau and must not conflict with any applicable Oregon Administrative Rule. Only approved Double Check Valve and Reduced Pressure type backflow assemblies, may be used for premises-isolation backflow protection. State and/or City required premises-isolation backflow protection is a condition of water service or continued service where an existing service requires premises-isolation protection. Premises-Isolation assemblies must not be removed, replaced, or relocated without first contacting the Water Bureau Water Quality Inspection group.

Backflow assemblies installed on water services that enter buildings with subgrade floors must conform to the following:

- Enter a building perpendicular to the centerline of the city water service and at an elevation as determined by the depth of the city water service at the R.O.W.
- Services entering at an elevation greater than 5-feet above-finished-floor (AFF) will require a permanent platform be installed. The platform will need to provide for 6-feet of vertical headroom. Assemblies 2" and smaller may have reduced clearances as approved by the Water Quality Inspector. Platforms must be engineered to comply with all applicable Oregon OSHA requirements and be detailed on all drawings submitted for review and permitting through City of Portland Bureau of Development Services (BDS).
- If water service enters a building at an elevation (determined by the depth of city water service at the R.O.W.) between one and 5-feet AFF, the assembly must be installed at water service entrance elevation.
- **If water service enters a building from below grade (slab-on-grade) or at an elevation less than 1-foot above finished floor (AFF), the assembly is to be raised to a minimum of 1-foot AFF (measured to the lowest part of the assembly).** If for the installation of a main shutoff valve, emergency shutoff valve, or to accommodate drainage for a RPBA relief-valve, the assembly may be placed at an elevation greater than the minimum. If it is determined by the Water Quality Inspector that arbitrary runs of exposed piping have been installed prior to an assembly, the assembly may either be required to be relocated or the piping be sleeved.

2. Premises-isolation assemblies approved to be installed inside buildings or structures must be installed at the water supply riser/supply pipe. The riser/supply pipe must be installed 12" from the property frontage foundation wall to the centerline of pipe on the centerline of the city water service as it runs perpendicular from the R.O.W. **Foundations, footings, slabs and/or walls must be sleeved or core-drilled to accommodate code compliant riser/supply pipe entrance locations.** Assemblies installed directly on vertical subgrade risers, or off a riser which enters the space at less than one foot and necessitates the addition of a vertical run of pipe to be raised to observe the required 12" minimum elevation, must be approved for vertical installation. For horizontal installations, and for assemblies which are not approved for vertical up installation, the riser must be equipped with a single 90-degree elbow and the assembly is to be no more than the pipe diameter in inches beyond the centerline (or outlet side of the) elbow to accommodate horizontal installations, excepting only the addition of a wye-strainer, flood control shut off valve or other, necessary appurtenance.

3. For parallel installations, the TEE shall be placed no more than the service pipe diameter, in inches, from the centerline (or outlet side) of the elbow installed on the riser. The parallel elbows shall be no more than 12" off the centerline of the TEE. The assemblies are to be installed no more than the pipe diameter in inches from the outlet side of the elbows off the Tee. In no circumstance may the lower assembly be less than 12" AFF (measured to the lowest point on the assembly) and the higher assembly may not be installed above 5' AFF (measured to the top of the assembly body) unless an OSHA approved permanently mounted platform is installed that meets the standards as outlined herein. In the case of parallel Reduced pressure assemblies the lower of the two will need to extend beyond the 4" minimum clearance behind to accommodate a drain assembly for relief valve orifice of the assembly above.

4. The installation of a backflow assembly may alter system operating pressure, flow and/or influence other hydraulic functions. Additionally, thermal expansion may result from the installation of a backflow assembly. The water user/installer is responsible for ensuring minimum system operating requirements can be met.

5. Retrofit/Replacement backflow assembly installations must meet current State and City installation requirements.
6. Backflow assemblies must be protected from severe environmental conditions. Only commercially manufactured prefabricated insulated outdoor enclosures are approved. All exposed piping inside enclosures must be insulated with commercially manufactured closed-cell pipe insulation or a heat source must be provided.
7. Premises-isolation backflow assemblies must be those approved by [University of Southern California Foundation for Cross-Connection Control and Hydraulic Research \(USC\)](#) and the Oregon Health Authority (OHA).
8. Only assemblies approved by USC may be installed vertically.
9. In addition to City Code [Title 21](#) and [Title 28, OAR 333-061-0070](#), Section 14, will apply to all existing premises-isolation backflow assembly installations. Required permits must be obtained and associated fees be paid prior to installing a premises-isolation backflow assembly.
10. Assemblies must be readily accessible with adequate room for testing and maintenance:
 - Assemblies 2 inches and smaller (excludes DCDA's, see next bullet) must maintain at least 4-inches clearance on all sides and at both ends, respectively. Assemblies larger than 2 inches (includes 2-inch DCDA's) must maintain at least 4-inches clearance on the backside, 3 inches at both ends, not less than 12-inches underneath, 24-inches in front and 36-inches vertically above assembly body (this clearance may be reduced to accommodate a platform if approved by the Water Bureau inspector).
11. A minimum of a Double Check Valve Assembly (DCVA) for premises-isolation must be installed on water services:
 - If the water meter is 2-inches or larger.
 - All services considered non-potable and do not pose a risk to health.
 - Existing services where water is being used for the sole purpose of facilitating temporary construction needs and does not pose a risk to health.
 - All premises having more than one domestic water service.
 - If the Water Bureau determines the backflow potential warrants and the use does not pose a risk to health.
12. Premises-Isolation assemblies installed at an elevation greater than 5-feet measured to top of assembly body AFF, must be provided with a permanently installed platform. Installations must meet Occupational Safety and Health Administration and State of Oregon Occupational Safety and Health codes. All horizontal and vertical runs of pipe prior to an assembly may be required to be sleeved with schedule-40 PVC pipe. Fire sprinkler system piping will be reviewed on a case-by-case basis regarding sleeving.
13. [Title 21.24.040](#) requires access be granted to all premises for inspection of water piping, as described therein.
14. Upon completion of a premises-isolation backflow assembly installation, Portland Water Bureau Water Quality Inspection must be notified. Installations must be inspected by a Water Bureau Water Quality Inspector and will require that a Backflow Inspection Fee be paid.
15. Water service must not be activated and is subject to termination without notice until all backflow assembly installation related work has been completed. Work must be completed prior to temporary or final occupancy being granted by a City of Portland Bureau of Development Services (BDS) Building Inspector.
16. Assemblies over 2 inches in size (includes 2-inch DCDA/RPDA) must be supported by rigidly mounted metal supports (Standon Pipe Supports or equivalent) underneath the shut-off valves at both ends of the assembly. All above-ground enclosures must be provided with concrete floors/pads, which may not be less than 4 inches in thickness. If suspended from ceilings, pipe hangers designed to carry the full load of the assembly must be installed.
17. No pressure testing is to be performed between a premises-isolation assembly and a Water Bureau valve in the right-of-way.
18. Assembly installations that incorporate the use of a wye-strainer, the strainer drain valve must not be threaded or have provision that will allow for hose connections or other plumbed arrangements.

Additional installation requirements for vaults and enclosures

When a Double Check Valve Assembly (DCVA) or a Double Check Detector Assembly (DCDA) is installed in a vault the following must be provided:

1. Adequate drainage: Backflow assemblies must not be installed in locations subject to flooding. Vault/enclosure installations must be provided with adequate drainage and drains may not be connected to sewers of any kind, catch basins, below the flood rim of swales or riverbanks. A sump pump will be required if vaults are unable to be kept free of standing water. Sump pump discharge piping must meet vault drainage requirements as stated herein.
2. Vault lids with hinged frame and covers (Oldcastle Infrastructure or equivalent); where applicable use Center-Offset frame and cover lids (Oldcastle Infrastructure or equivalent). These will allow for necessary clearance for ladders in single assembly installations. For multiple assemblies in a common vault, (Oldcastle Infrastructure or equivalent) centered frame & cover lids may better accommodate installation criteria. For parking lot, driveway, loading dock applications and/or heavy commercial traffic applications, a minimum of EJ USA Inc. #8217, 36" X 36" or #8217-Double 36" X 74" frame and covers or equivalent must be used. As determined by the Water Bureau, part #8197, 36" X 36" or #8197-Double, 36" X 74" frame and covers may be required. **Manhole covers are not permitted.**
3. An approved rigidly mounted ladder, with an extension which extends 3' above the vault lid (Oldcastle Infrastructure Pull-Up Extension, Bilco LU-1 or equivalent) is required if the vault or chamber is 4' or greater in depth. The ladder must be mounted vertically in the entryway of the vault or chamber and be securely anchored at top and bottom. Ladder orientation must not impede clear access to the assembly and/or vault floor. The top and bottom rungs must be within 12" of the opening and floor, respectively. All rungs must have at least 7" of toe clearance, with the exception; if the top rung is at the same elevation as the opening the clearance may be no less than 2.5". The ladder must not encroach on the installation clearances for the type of assembly required. For single & multiple assembly installations, refer to item #2 above to ensure proper ladder placement.
4. A moisture-proof light fixture will be required if adequate lighting is not available.
5. At least 6-feet of vertical headroom is required for all vault, chamber, enclosure, and basement installations. Full opening double doors (Oldcastle Infrastructure 332P-2 or EJ USA Inc. #8127-Double or equivalent) can be used to obtain the 6-foot requirement but must encompass the entire lay-length of the assembly and must not encroach on required ladder clearances. Refer to item #2 above for proper vault lid and frame & cover applications.
6. It is recommended when 2" and 1-1/2" Double Check Valve Assemblies (Excludes fire service assemblies, see information under "fire sprinkler services") are installed below grade the Carson Industries plastic box #1730-18 be used or equivalent. For 1" and smaller assemblies, Carson Industries box #1419-18 is recommended or equivalent. All assemblies 2" and smaller (Excludes fire service assemblies, see information under "fire sprinkler services") must be installed no more than 24" below finished grade. If installed greater than 24", assemblies must be installed in a precast concrete vault that meets vault clearance standards as stated herein.
7. All backflow assemblies installed below grade must be provided with test cock plugs.
8. Assemblies larger than 2" (Includes 2" fire service DCDA's ([see fire sprinkler information](#))), only pre-cast vaults (Oldcastle Infrastructure or equivalent) that accommodate the installation criteria will be accepted. This applies to all below grade new service and retrofit of existing service installations. See item #2 above for more detailed information regarding vault lids and associated application criteria.
9. Above ground enclosure installations may have clearances less than those mentioned for vault installations, provided they are equipped with removable panels, doors and tops that create clearances equal to or greater than those described herein. Only commercially manufactured prefabricated insulated outdoor enclosures will be approved. All exposed piping inside enclosures must be insulated with commercially manufactured closed-cell pipe insulation or a heat source must be provided.
10. All vaults and enclosures for backflow assemblies must be kept free of any debris and/or objects that interfere with these installation requirements and those applicable to [OAR 333-061-0071](#). Vaults and enclosures must not contain loose fill materials or debris of any kind.

Premises-Isolation Reduced Pressure Backflow Assembly (RPBA) installations requirements

1. An approved airgap must be located directly below the relief valve orifice. The airgap must be at least twice the inside diameter of the relief-valve, measured vertically above the top of any drain or receiving vessel. The air-gap must never be less than 1". A RPBA must always be installed 12" above finished grade or the 100-year flood-plain, whichever is greater and meet all applicable drainage requirements stated herein.
2. When a RPBA is installed in an above ground enclosure, the enclosure drain must drain to finished grade and be able to discharge the full rated flow of the relief-valve. The relief-valve must be located 12" above finished slab elevation.
3. When a RPBA is installed in a vault or enclosure in a berm or hillside, a horizontal boresight drain to daylight must be provided. The drain must discharge to finished grade and/or be above the 100-year flood plain, whichever is greater. The relief-valve must be located 12" above the top of the vault drain opening. The bottom of the discharge end of the bore-sight drain must be at least 12" above the flood rim of any physical feature such as but not limited to; ponds, fountains, lakes, rivers, swales and/or any other type of receiving vessel. The bore-sight drain must be in a level horizontal orientation and must be screened off at both ends and not have a lay length of greater than 20-feet. The bore-sight drain must never be connected to a sewer of any kind, catch basins, sumps, or dry wells. The drain must never be less than 12" above the flood elevation of a water source, swale or any other catchment subject to overflow/flooding.
4. The proposed installation of a RPBA in an area that may be subject to flooding must be reviewed and approved by Portland Water Bureau Water Quality Inspection prior to installation. Interior and basement installations must provide drainage for the full rated flow of the relief-valve, or the supply piping must be equipped with an approved Flood Protection Shut Down Valve.
5. A premises-isolation RPBA must be installed on all water service connections that pose a risk to health. The Portland Water Bureau will determine the degree of risk. RPBA installations must meet all applicable Oregon Administrative Rules, 333-061-0070, Title 21, and Title 28, respectively.
6. A premises-isolation reduced pressure type backflow assembly is required to be installed on all water service connections as listed but not limited to: premises having private wells, water features (swimming pools), geothermal heating & cooling systems, hydronic heating systems, cooling towers, that have access to rivers, lakes, ponds and/or other water sources that can be connected to; are equipped with storage tanks, rainwater-harvesting (excluding those that simply capture rainwater in containers of less than 50 gallons and gravity-feed to landscape), storm-water or groundwater recovery and reuse systems and/or that use, or reuse treated wastewater (grey and/or black-water) on site. A RPBA may required to be installed on any water service that is considered potable and provides for the use of water as a medium for purposes other than potable drinking water. A RPBA is required where the water is treated in any way. Assemblies must be installed on private property at the property line (service connection/point-of-delivery as defined in OAR), on the centerline of the city water service as it runs perpendicular from the R.O.W.
7. A RPBA must be installed on all service connections to industrial premises where complex (degree of complexity to be determined by the Water Bureau) intricate plumbing systems exist.
8. Services supplying premises that are equipped with frost-free drain-back yard hydrants and/or Sanitary Yard Hydrants must be equipped with a RPBA.
9. A reduced pressure type assembly must be installed on all water service connections to premises with high-rise buildings (high-rise building: where a building is 75-feet or greater above its lowest finished-floor (slab) elevation to top of structure).
10. A reduced pressure type backflow assembly will be required on services to premises with piping systems adjacent to waterways that may be subject to immersion due to periods of highwater incidents. If available, current GIS data will be used to make this determination.
11. A RPBA must be installed on domestic water services to mixed-use and multi-tenant premises.
12. A RPBA must be installed on domestic water services to premises where shell buildings are constructed or renovated when occupancy is undetermined at the time of construction and/or renovation.

13. A RPBA is required to be installed on all service connections to vending/food cart lots and lots having below grade drain back yard-hydrants.

Requirements for backflow assemblies installed on fire sprinkler water services

1. A Double Check Detector Assembly (DCDA) is typically the type of backflow assembly installed on fire sprinkler water services. See note below. If the fire sprinkler service is fully metered (a meter approved by the Water Bureau for fire flow application and billing purposes) a Double Check Valve Assembly (DCVA) or Reduced Pressure Backflow Assembly (RPBA) may be installed depending on sprinkler system type. **Note:** A Reduced Pressure Detector Assembly (RPDA) is required to be installed where; storage tanks are provided, if the structure is considered a “high-rise” (requirement stated herein) if supplying marinas, moorages, premises having docks and piers, when rainwater-harvesting, storm-water and/or groundwater recovery and reuse systems are installed and/or that use, or reuse treated wastewater (grey and/or black-water).

2. Backflow assemblies installed on water services for fire use only; must be installed on private property at the property line (service connection/point-of-delivery as defined in the OAR) on the centerline of the city water service as it runs perpendicular from the R.O.W. Assemblies approved to be installed inside buildings or structures must be located at the water riser/supply pipe. The riser/supply pipe location must meet location criteria as stated herein. If the available area between a building and the property line is adequate (determined by the Bureau), the vault, chamber, or enclosure for the type of backflow assembly required must be installed outside the confines of the building or structure. If the available area is not able to accommodate the enclosure required (determined by the Bureau), the assembly must be installed on the water supply riser/supply pipe and conform to the AFF criteria as stated herein. The water riser/supply pipe must be installed 12” from the foundation frontage wall to centerline of pipe on the centerline of the city water service as it runs perpendicular from the R.O.W. Prior to installing a backflow assembly within a building or structure, accurate drawings must be submitted to Portland Water Bureau Water Quality Inspection group for approval. Drawings must show property lines, building setbacks, identify street frontage, water main, service location and proposed backflow assembly type and location. An inspection fee must be paid to the Water Bureau prior to replacement of an existing assembly or newly installed assembly on a dedicated fire service. Where existing fire sprinkler system water piping is significantly remodeled (significance determined by the Bureau) or modified, unapproved assemblies and or devices are to be replaced with those currently approved. The installation must be compliant with this code and/or any applicable OAR. See OAR 333-061-0070, Section 14, which specifically addresses existing installations. **Additionally, all piping for fire sprinkler system backflow assembly installations must be compliant with the local Fire code. Underground piping requires a minimum 3 feet of cover and may also require a permit be taken out from the Fire Marshal’s office.**

3. Where anti-freeze compounds, chemicals, gases, or any other additives are added to a fire sprinkler system, a Reduced Pressure Detector Assembly (RPDA) will be required. Where it is possible for a fire sprinkler system to be connected to or be augmented by any auxiliary water source a RPDA will be required. The RPDA must be installed at the service connection/point-of-delivery to the premises as outlined herein and as defined by OAR Chapter 333-061-0020. All applicable [RPBA installation criteria](#) will apply. Fire systems that incorporate the use of storage tanks must be equipped with a RPDA and are required to be installed at the service connection/point-of-delivery to the premises as outlined herein.

4. When a DCDA is installed in a vault the metered by-pass must be plumbed on the side of the assembly opposite of the ladder. 4” clearance is required between the wall and the bypass, 24” clearance in front, 12” underneath, 3” at both ends and 36” vertically above the assembly body. Vaults must accommodate 6-feet of vertical headroom or have hinged double door opening frame and covers that accommodate the entire lay length of the assembly. [Find more information related to vault lid and door applications](#) under the section “Additional installation requirements for vaults and enclosures”.

Bypass meters equipped with touch read register and touchpad or radio signal transmitters

1. All Double Check Detector Assemblies (DCDA's) and Reduced Pressure Detector Assemblies (RPDA's) required to be installed by the Portland Water Bureau must be equipped with a Water Bureau approved bypass meter and compatible touchpad. The touchpad must be accessible from the right-of-way.
2. Only 5/8"x 3/4" Neptune T-10 positive displacement meters with high resolution registers are to be used. Registers must read in cubic feet. Touchpads must be compatible with these meters. Compatible touch-pads for the above meter are Neptune model #12081-000 (wall mount application), Neptune model 12223-150 (vault door application, requires a 1 3/4" hole).
3. All wiring from the touchpad to the bypass meter must be insulated 1 pair solid 22 AWG copper wires secured so as not to interfere with the operation and maintenance of the backflow assembly. Wires must not encumber the vault opening or ladder. Where the touch-pad wire follows the path of other electrical wiring, shielded wire as described above must be used. Splices must be made with 3M Scotchlok moisture resistant connectors, part number UR or UY or equivalent. All splices must be accessible.
4. Touchpad mounting options:
 - On an outside building wall, at a height between 1' and 5' above the floor or finished grade and within 50' of the backflow assembly. All wires running from the bypass meter to the touchpad must be in conduit.
 - May be mounted on the vault door. This orientation should locate the touchpad near the hinged portion of the door so as not to stress the wire between the touchpad and meter when the door is fully opened.
 - May be installed in the concrete portion of the vault top, the touch pad must be easily accessible for replacement.
 - If touch-pad wire must be run underground the wire must be routed through PVC conduit from the meter to the touchpad.
 - Touchpads not installed in vault doors or on a building face must be installed using the Brooks #37, 12" X 20" box w/T&R lid.
 - Touchpads or transmitters must be rigidly mounted and be serviceable. Mounting hardware must be of a type, whereby removal and reinstallation may be accomplished without damaging the unit.