



Requirements for Commercial Backflow Assembly Installations

City of Richmond, Planning and Development Review

A plumbing permit is required for the installation of a new backflow assembly and for the replacement of an existing assembly, if the plumbing system is altered by the replacement.

A plumbing permit is not required for replacing an existing assembly in kind or for repairs to an existing assembly without altering the plumbing system.

Plumbing drawings must accompany each commercial backflow plumbing permit application. This document is intended to highlight what information is required on the plumbing plan to ensure compliance with the Virginia Plumbing Code.

[108.2\(14.2\)](#)

Drawings shall be sealed by a Professional Engineer. For jobs with a total value of less than \$10K, a Master Plumber may design the plan provided the plans are of similar quality to those typically produced by a Professional Engineer and the plans follow the City of Richmond Minimum Plumbing Plan Requirements document linked below.

[Code of VA §54.1-410\(A\)](#)

Specify the assembly. Please note the Department of Public Utilities generally requires protection through a Reduced Pressure Principal Assembly.

[303.2/608.1](#)

Provide a floor plan showing the location of the assembly within or outside of the structure and its connection to the existing plumbing system. If the assembly is installed outside of the structure, indicate the method of freeze protection. If the assembly is installed inside of the structure, demonstrate where the relief port will discharge.

[608.15/608.15.1/608.15.2.1](#)

Indicate how thermal expansion will be provided for each water heater that receives water through the assembly.

[303.2/607.3](#)

Include the calculations that demonstrate the minimum water pressure will be maintained to all plumbing fixtures with the addition of this pressure reducing device.

[604.3](#)

Once the plan has been approved by PDR and DPU you will receive notice that your approved plumbing construction documents are available on the permit portal. Please print these documents and have them onsite for your inspector. For final approval you will need to provide a backflow certification form from a licensed backflow worker to your inspector.

[312.10.2](#)

The Department of Public Utilities may have additional requirements in excess of the Virginia Plumbing Code. Please contact the DPU Cross Connection Reviewer for more information:

Alexander.broadus@rva.gov

Lawrence.williams@rva.gov

City of Richmond Plumbing Plan Minimum Requirements Document:

[Plumbing-Gas Plans Minimum Requirements 03-04-2025_0.pdf](#)

Planning and Development Review homepage:

[Planning and Development Review | Richmond](#)

Referenced Code Sections:

108.2 Exemptions from application for permit.

Notwithstanding the requirements of Section 108.1, application for a permit and any related inspections shall not be required for the following; however, this section shall not be construed to exempt such activities from other applicable requirements of this code. In addition, when an owner or an owner's agent requests that a permit be issued for any of the following, then a permit shall be issued and any related inspections shall be required.

14.2. Replacement of plumbing fixtures and well pumps in all groups without alteration of the water supply and distribution systems, sanitary drainage systems or vent systems.

Code of VA §54.1-410(A)/ Building and Fire Code Related Regulations Chart C

In accordance with §54.1-410(A) of the Code of Virginia, officials of local building departments may require A/E design even if not required by state law.

Exempt construction documents must bear the name and address of the author and his or her occupation. (Master Plumber at minimum COR requirement)

303.2 Installation of materials.

Materials used shall be installed in strict accordance with the standards under which the materials are accepted and approved. In the absence of such installation procedures, the manufacturer's instructions shall be followed. Where the requirements of referenced standards or manufacturer's installation instructions do not conform to minimum provisions of this code, the provisions of this code shall apply.

608.1 General.

A potable water supply system shall be designed, installed and maintained in such a manner so as to prevent contamination from nonpotable liquids, solids or gases being introduced into the potable water supply through cross connections or any other piping connections to the system. Backflow preventer applications shall conform to Table 608.1 except as specifically stated in Sections 608.2 through 608.17.10

TABLE 608.1 APPLICATION OF BACKFLOW PREVENTERS

DEVICE	DEGREE OF HAZARD ^a	APPLICATION ^b	APPLICABLE STANDARDS
Backflow prevention assemblies:			
Double check backflow prevention assembly and double check fire protection backflow prevention assembly	Low hazard	Backpressure or backsiphonage Sizes $\frac{3}{8}$ "–16"	ASSE 1015 ; AWWA C510 ; CSA B64.5 ; CSA B64.5.1
Double check detector fire protection backflow prevention assemblies	Low hazard	Backpressure or backsiphonage Sizes 2"–16"	ASSE 1048
Pressure vacuum breaker assembly	High or low hazard	Backsiphonage only Sizes $\frac{1}{2}$ "–2"	ASSE 1020 ; CSA B64.1.2
Reduced pressure principle backflow prevention assembly and reduced pressure principle fire protection backflow assembly	High or low hazard	Backpressure or backsiphonage Sizes $\frac{3}{8}$ "–16"	ASSE 1013 ; AWWA C511 ; CSA B64.4 ; CSA B64.4.1
Reduced pressure detector fire protection backflow prevention assemblies	High or low hazard	Backsiphonage or backpressure (automatic sprinkler systems)	ASSE 1047
Spill-resistant vacuum breaker assembly	High or low hazard	Backsiphonage only Sizes $\frac{1}{4}$ "–2"	ASSE 1056 ; CSA B64.1.3
Backflow preventer plumbing devices:			
Antisiphon-type fill valves for gravity water closet flush tanks	High hazard	Backsiphonage only	ASSE 1002/ASME A112.1002/CSA B125.12 ; CSA B125.3
Backflow preventer for carbonated beverage machines	Low hazard	Backpressure or backsiphonage Sizes $\frac{1}{4}$ "– $\frac{3}{8}$ "	ASSE 1022
Backflow preventer with intermediate atmospheric vents	Low hazard	Backpressure or backsiphonage Sizes $\frac{1}{4}$ "– $\frac{3}{4}$ "	ASSE 1012 ; CSA B64.3
Backflow preventer with intermediate atmospheric vent and pressure-reducing valve.	Low hazard	Backpressure or backsiphonage Sizes $\frac{1}{4}$ "– $\frac{3}{4}$ "	ASSE 1081
Dual-check-valve-type backflow preventer	Low hazard	Backpressure or backsiphonage Sizes $\frac{1}{4}$ "–1"	ASSE 1024 ; CSA B64.6
Hose connection backflow preventer	High or low hazard	Low head backpressure, rated working pressure, backpressure or backsiphonage Sizes $\frac{1}{2}$ "–1"	ASME A112.21.3 ; ASSE 1052 ; CSA B64.2.1.1
Hose connection vacuum breaker	High or low hazard	Low head backpressure or backsiphonage Sizes $\frac{1}{2}$ ", $\frac{3}{4}$ ", 1"	ASME A112.21.3 ; ASSE 1011 ; CSA B64.2 ; CSA B64.2.1
Laboratory faucet backflow preventer	High or low hazard	Low head backpressure and backsiphonage	ASSE 1035 ; CSA B64.7
Pipe-applied atmospheric-type vacuum breaker	High or low hazard	Backsiphonage only Sizes $\frac{1}{4}$ "–4"	ASSE 1001 ; CSA B64.1.1
Vacuum breaker wall hydrants, frost-resistant, automatic-draining-type	High or low hazard	Low head backpressure or backsiphonage Sizes $\frac{3}{4}$ ", 1"	ASME A112.21.3 ; ASSE 1019 ; CSA B64.2.2

608.15.1 Outdoor enclosures for backflow prevention devices.

Outdoor enclosures for backflow prevention devices shall comply with ASSE 1060.

608.15 Location of backflow preventers.

Access for inspection, testing, service, repair and replacement shall be provided to backflow prevention assemblies. Backflow prevention assemblies shall be installed between 12 inches and 60 inches from grade, floor level or service platform and as specified by the manufacturer's instructions. Where the manufacturer's listed installation height conflicts with this requirement, the manufacturer's listed heights shall apply. Access shall be provided to backflow prevention devices and as specified by the manufacturer's instructions.

608.15.2.1 Relief port piping.

The termination of the piping from the relief port or air gap fitting of a backflow preventer shall discharge to an approved indirect waste receptor or to the outdoors where it will not cause damage or create a nuisance. The indirect waste receptor and drainage piping shall be sized to drain the maximum discharge flow rate from the relief port as published by the backflow preventer manufacturer.

607.3 Thermal expansion control.

Where a storage water heater is supplied with cold water that passes through a check valve, pressure reducing valve or backflow preventer, a thermal expansion control device shall be connected to the water heater cold water supply pipe at a point that is downstream of all check valves, pressure reducing valves and backflow preventers. Thermal expansion tanks shall be sized in accordance with the tank manufacturer's instructions and shall be sized such that the pressure in the water distribution system shall not exceed that required by Section 604.8

312.10.2 Testing.

Reduced pressure principal, double check, pressure vacuum breaker, reduced pressure detector fire protection, double check detector fire protection and spill-resistant vacuum breaker backflow preventer assemblies and hose connection backflow preventers shall be tested at the time of installation, immediately after repairs or relocation and at least annually.

604.3 Water distribution system design criteria.

The water distribution system shall be designed, and pipe sizes shall be selected such that under conditions of peak demand, the capacities at the fixture supply pipe outlets shall be not less than shown in Table 604.3. The minimum flow rate and flow pressure provided to fixtures and appliances not listed in Table 604.3 shall be in accordance with the manufacturer's installation instructions.

TABLE 604.3
WATER DISTRIBUTION SYSTEM DESIGN CRITERIA REQUIRED CAPACITY AT FIXTURE SUPPLY PIPE OUTLETS

FIXTURE SUPPLY OUTLET SERVING	FLOW RATE ^a (gpm)	FLOW PRESSURE (psi)
Bathtub, balanced-pressure, thermostatic or combination balanced-pressure/thermostatic mixing valve	4	20
Bidet, thermostatic mixing valve	2	20
Combination fixture	4	8
Dishwasher, residential	2.75	8
Drinking fountain	0.75	8
Laundry tray	4	8
Lavatory, private	0.8	8
Lavatory, private, mixing valve	0.8	8
Lavatory, public	0.4	8
Shower	2.5	8
Shower, balanced-pressure, thermostatic or combination balanced-pressure/thermostatic mixing valve	2.5 ^b	20
Sill cock, hose bibb	5	8
Sink, residential	1.75	8
Sink, service	3	8
Sink, service	3	8
Urinal, valve	12	25
Water closet, blow out, flushometer valve	25	45
Water closet, flushometer tank	1.6	20
Water closet, siphonic, flushometer valve	25	35
Water closet, tank, close coupled	3	20
Water closet, tank, one piece	6	20

For SI: 1 pound per square inch = 6.895 kPa, 1 gallon per minute = 3.785 L/m.

a. For additional requirements for flow rates and quantities, see [Section 604.4](#).

b. Where the shower mixing valve manufacturer indicates a lower flow rating for the mixing valve, the lower value shall be applied.

Plumbing/Gas Plan Review:

Thomas.walker@rva.gov

804-389-9015

Permit Intake Operations:

Karen.paquette@rva.gov

804-389-8367

Commercial Plan Review Supervisor:

Susan.harold@rva.gov

804-646-5618

DPU Cross Connection Review:

Alexander.broaddus@rva.gov

804-658-8661

Lawrence.williams@rva.gov

804-337-8436