

Chapter 10

Water Supply and Distribution

10.1 QUALITY OF WATER SUPPLY

Only potable water shall be supplied to plumbing fixtures used for drinking, bathing, culinary use or the processing of food, medical or pharmaceutical products.

10.2 IDENTIFICATION OF POTABLE AND NON-POTABLE WATER

In buildings where dual water distribution systems are installed, one potable water and the other non-potable water, each system shall be identified either by color marking or metal tags, or other appropriate methods such as may be approved by the Authority Having Jurisdiction. Each outlet on the non-potable water line that may be used for drinking or domestic purposes shall be posted: **DANGER-UNSAFE WATER**. See Figure 10.2

SERVICE AND BACKGROUND COLOR

Potable Water = GREEN
Non-Potable Water = YELLOW
Cold Water Supply = GREEN
Hot Water Supply = YELLOW
Hot Water Return = YELLOW
Sanitary Drain = GREEN
Plumbing Vent = GREEN
Waste = GREEN
Waste (corrosive) = YELLOW
Storm Drain = GREEN
Roof Drain = GREEN
Fire Protection = RED

NOTES:

1. Color coding of piping is based on ANSI A13.1 - *Scheme for the Identification of Piping Systems*.

Figure 10.2
COLOR CODING FOR PIPING

10.3 WATER REQUIRED

10.3.1 Buildings

Plumbing fixtures shall be provided with a potable supply of water in the amounts and at the pressures specified in this Chapter.

10.4 PROTECTION OF POTABLE WATER SUPPLY

10.4.1 General

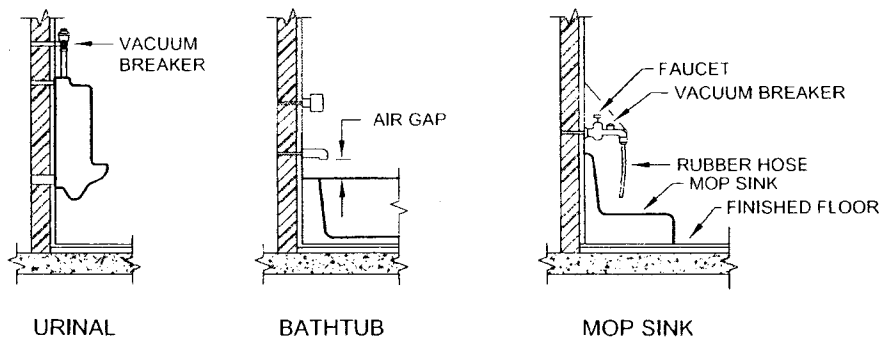
A potable water supply shall be designed, installed and maintained to prevent contamination from non-potable liquids, solids or gases by cross connections.

10.4.2 Interconnections

Interconnections between two or more public water supplies shall be permitted only with the approval of the Authority Having Jurisdiction.

10.4.3 Cross Connection Control

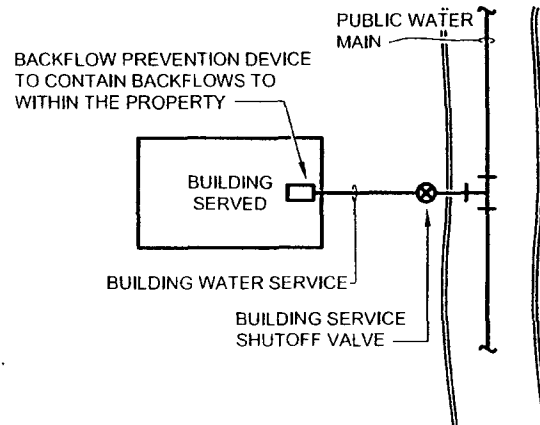
Potable water supplies shall be protected in accordance with the cross connection control program of the Authority Having Jurisdiction and the provisions of this Code. Cross connection control shall be provided at individual outlets, and where required, by containment of the premises. Each potential cross connection within the premises shall be protected. Where containment is required, the potable water supply shall be protected by a backflow protection device installed immediately downstream of the meter or between the service shutoff valve and the first outlet or branch connection. See Figures 10.4.3 - A and - B



NOTES:

1. Individual outlet protection is required by this Code. It protects the potable water distribution piping from being contaminated by a cross connection within the property.

Figure 10.4.3 - A
CROSS CONNECTION CONTROL BY INDIVIDUAL OUTLET PROTECTION



NOTES:

1. Cross connection control by containment protects the public water supply from being contaminated by a cross connection within a customer's property.

**Figure 10.4.3 - B
CROSS CONNECTION CONTROL BY CONTAINMENT OF THE BUILDING**

10.4.4 Private Supplies

- a. Private potable water supplies (i.e., wells, cisterns, lakes, streams) shall require the same backflow protection that is required for a public potable water supply.
- b. Cross connection between a private potable water supply and a public potable water supply shall not be made unless specifically approved by the Authority Having Jurisdiction.

Comment: Interconnections between private water supplies and public water supplies are generally prohibited because private supplies are usually not monitored continuously for water quality.

10.4.5 Toxic Materials

- a. Piping conveying potable water shall be constructed of non-toxic material.
- b. The interior surface of a potable water tank shall not be lined, painted, or repaired with any material that will affect either the taste, odor, color or potability of the water supply when the tank is placed in or returned to service.

Comment: The toxicity rating of a piping material can be found in the material standard listed in Table 3.1.3. The piping materials listed in Table 3.4 are non-toxic and are suitable for conveying potable water.

10.4.6 Reserved

10.4.7 Reserved

10.4.8 Used Materials

Materials that have been used for any purpose other than conveying potable water shall not be used for conveying potable water.

10.4.9 Water As a Heat-Transfer Fluid

Potable water may be used as a heat-transfer fluid provided the system design is approved by the Authority Having Jurisdiction.

10.5 BACKFLOW PREVENTION

10.5.1 Plumbing Fixtures, Appliances, Water Supply Outlets

The water supply shall be protected from back-siphonage by a fixed air gap between the potable water outlet and the overflow level of the fixture or receptor.

10.5.2 Requirements for Air Gaps

a. How Measured: The air gap shall be measured vertically from the lowest end of a potable water outlet to the flood rim or line of the fixture or receptor into which it discharges.

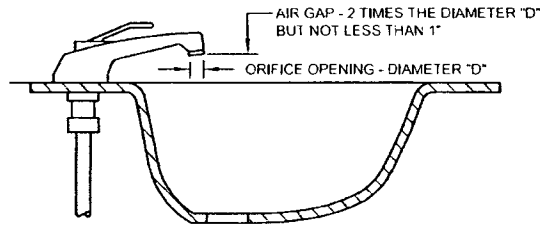
b. Minimum Size (distance): The minimum required air gap shall be twice the effective opening of a potable water outlet unless the outlet is a distance less than 3 times the effective opening away from a wall or similar vertical surface in which case the minimum required air gap shall be 3 times the effective opening of the outlet. In no case shall the minimum required air gap be less than that shown in Table 10.5.2. See Figure 10.5.2

Table 10.5.2
MINIMUM AIR GAPS FOR PLUMBING FIXTURES

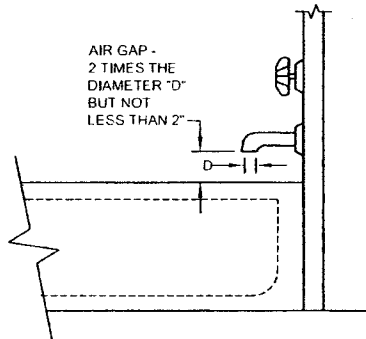
Fixture	Minimum Air Gap	
	When not Affected By Near Wall ¹ (Inches)	When Affected By Near Wall ² (Inches)
Lavatories with effective opening not greater than 1/2 inch diameter	1	1-1/2
Sink, laundry trays, goose-neck bath faucets and other fixtures with effective openings not greater than 3/4" diameter	1-1/2	2-1/4
Over rim bath fillers and other fixtures with effective openings not greater than 1 inch diameter	2	3
Drinking water fountains-single orifice not greater than 7/16 (0.437) in. diameter or multiple orifices having total area of 0.150 square inches (area of circle 7/16 in. diameter)	1	1-1/2
Effective openings greater than one inch	2X diameter of effective opening	3X diameter of effective opening

1. Side walls, ribs or similar obstructions do not affect air gaps when spaced from inside edge of the spout opening a distance greater than three times the diameter of the effective opening for a single wall, or a distance greater than four times the diameter of the effective opening for two intersecting walls.

2. Vertical walls, ribs, or similar obstructions extending from the water surface to or above the horizontal plane of the spout opening require a greater air gap when spaced closer to the nearest inside edge of the spout opening than specified in Note 1. above. The effect of three or more such vertical walls or ribs has not been determined. In such cases, the air gap shall be measured from the top of the wall.



TYPICAL LAVATORY FAUCET - AIR GAP



TYPICAL TUB FILLER - AIR GAP

NOTES:

1. Diameter "d" is the opening on the faucet aerator, tub spout, or outlet pipe

Figure 10.5.2
MINIMUM REQUIRED AIR GAPS

10.5.3 Required Backflow Prevention Devices

The following requirements shall apply:

A. Backsiphonage, Non-Continuous Pressure, Non-Health Hazard

1. Atmospheric vacuum breaker - ASSE 1001 (AVB)
2. Hose connection vacuum breaker - ASSE 1011
3. Any backflow protection device approved for protection against backsiphonage with non-continuous or continuous pressure and a non-health hazard or health hazard.

B. Backsiphonage, Continuous Pressure, Non-Health Hazard

1. Pressure vacuum breaker - ASSE 1020 (PVB)
2. Spill-resistant vacuum breaker - ASSE 1056 (SVB)
3. Backflow preventer with intermediate atmospheric port - ASSE 1012
4. Double check valve assembly ASSE 1015 (DC and DCVA)
5. Any backflow protection device approved for protection against backsiphonage with continuous pressure and a non-health hazard or health hazard.

C. Backsiphonage, Non-Continuous Pressure, Health Hazard

1. Atmospheric vacuum breaker - ASSE 1001 (AVB)
2. Hose connection backflow preventer - ASSE 1052
3. Any backflow protection device approved for protection against backsiphonage with non-continuous or continuous pressure and a health hazard.

D. Backsiphonage, Continuous Pressure, Health Hazard

1. Pressure vacuum breaker - ASSE 1020 (PVB)
2. Spill-resistant vacuum breaker - ASSE 1056 (SVB)
3. Reduced pressure backflow preventer assembly - ASSE 1013 (RP, RPZ, and RPBA)
4. Any backflow protection device approved for protection against backsiphonage with continuous pressure and a health hazard.

E. Back Pressure, Non-Health Hazard

1. Dual check backflow preventer - ASSE -1024 (DuCh)
2. Double check valve assembly - ASSE 1015 (DC)(DCVA)
3. Reduced pressure backflow preventer assembly - ASSE 1013 (RP)(RPZ)(RPBA)

F. Back Pressure, Health Hazard

1. Reduced pressure backflow preventer assembly - ASSE 1013 (RP)(RPZ)(RPBA)

10.5.4 Approval of Devices

Backflow prevention devices shall be listed or certified by a recognized certification body as complying with the appropriate standards in Table 3.1.3 - Part IX.

10.5.5 Installation of Backflow Preventers

a. Devices of All Types: All backflow prevention devices shall be accessible. Backflow prevention devices having atmospheric vents shall not be installed in pits, vaults, or similar potentially submerged locations. Vacuum breakers and other devices with vents to atmosphere shall not be located within fume hoods.

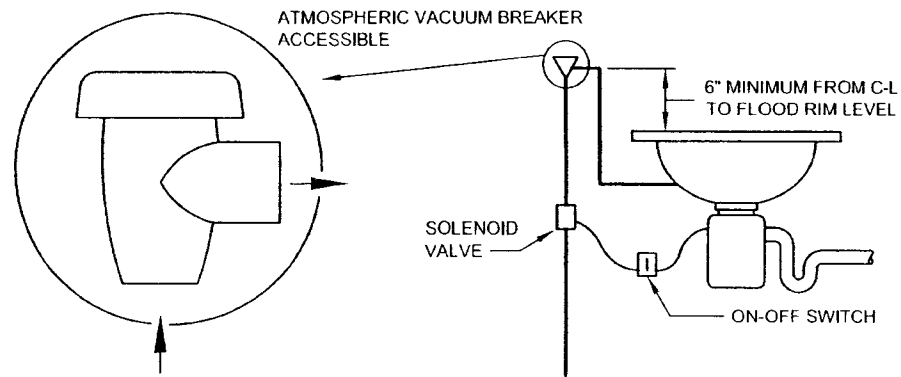
b. Atmospheric Vacuum Breakers: Pipe applied atmospheric vacuum breakers shall be installed with the critical level at least six inches above the flood level rim or highest point of discharge of the fixture being served. Approved deck-mounted and pipe-applied vacuum breakers and vacuum breakers within equipment, machinery and fixtures where the critical level is a specified distance above the source of contamination shall be installed in accordance with manufacturer's instructions with the critical level not less than one inch above the flood level rim. Such devices shall be installed on the discharge side of the last control valve to the fixture and no shut-off valve or faucet shall be installed downstream of the vacuum breaker. Vacuum breakers on urinals shall be installed with the critical level six inches above the flood level rim.

See Figures 10.5.5 - A through - F. Also Figures 10.5.10 - A through - C

c. Pressure Type Vacuum Breakers: Pressure type vacuum breakers shall be installed with the critical level at a height of at least 12 inches above the flood level rim for ASSE 1020 devices and with the critical level at least six inches above the flood level rim or highest point of discharge of the fixture being served for ASSE 1056 devices. Deck-mounted and pipe-applied pressure type (ASSE 1056) vacuum breakers within equipment, machinery and fixtures where the critical level is a specified distance above the source of contamination shall be installed in accordance with manufacturer's instructions with the critical level not less than one inch above the flood level rim. **See Figure 10.5.5 - G. Also Figures 10.5.10 - D and - E**

d. Double Check Valves and Reduced Pressure Principle Valves: Such devices shall be installed at not less than 12 inches above the floor or permanent platform with the maximum of 60 inches above floor or permanent platform. **See Figures 10.5.5 - H and - I. Also 10.5.10 - F**

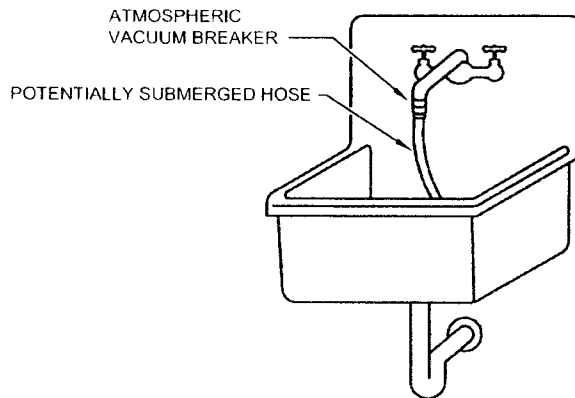
e. Spill-resistant Vacuum Breakers: Approved deck mounted and pipe-applied spill-resistant vacuum breakers within equipment, machinery and fixtures where the critical level is a specified distance above the source of contamination shall be installed in accordance with manufacturer's instructions with the critical level not less than one inch above the flood level rim.



NOTES:

1. If the critical level (C-L) is not marked on the vacuum breaker body, the bottom of the valve is considered to be the C-L reference.
2. Atmospheric vacuum breakers are not rated for periods of more than 12 hours of continuous water pressure.

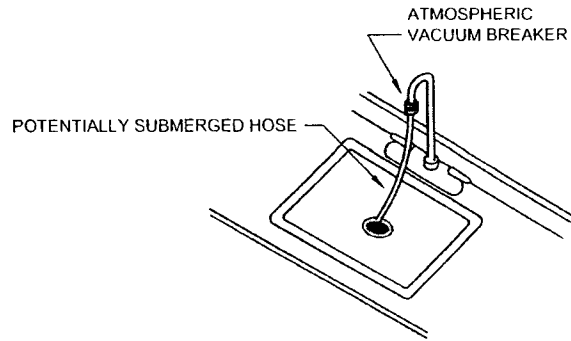
Figure 10.5.5 - A
THE POTABLE WATER SUPPLY TO A COMMERCIAL FOOD WASTE GRINDER
PROTECTED BY AN ATMOSPHERIC VACUUM BREAKER



NOTES:

1. Atmospheric vacuum breakers are not rated for periods of more than 12 hours of continuous water pressure.

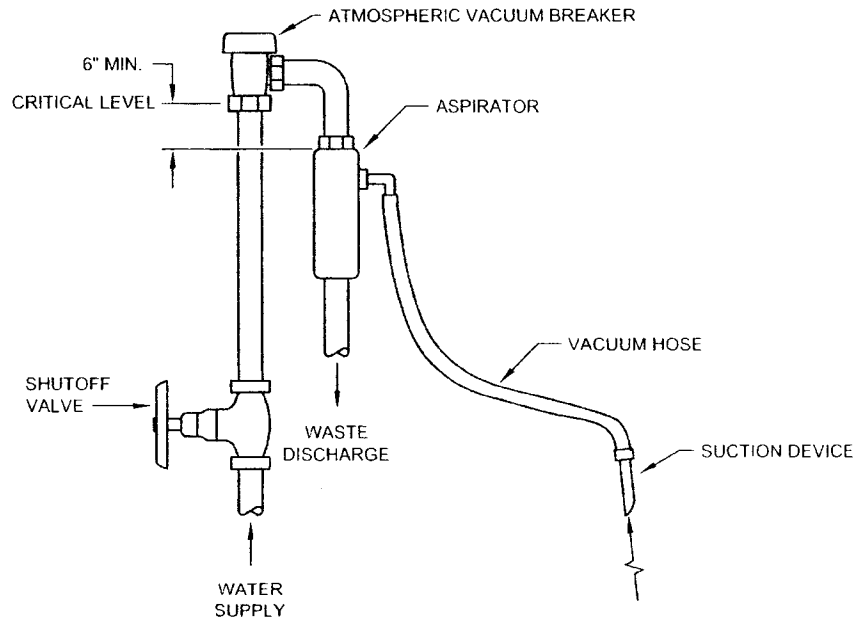
Figure 10.5.5 - B
THE POTABLE WATER SUPPLY TO A SERVICE SINK
PROTECTED BY AN ATMOSPHERIC VACUUM BREA



NOTES:

1. Atmospheric vacuum breakers are not rated for periods of more than 12 hours under continuous water pressure.

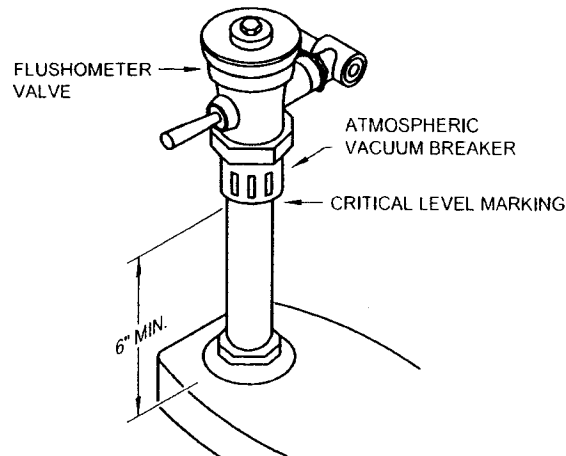
Figure 10.5.5 - C
THE POTABLE WATER SUPPLY TO A LAB SINK
PROTECTED BY AN ATMOSPHERIC VACUUM BREAKER



NOTES:

1. Atmospheric vacuum breakers are not rated for periods of more than 12 hours under continuous water pressure.

Figure 10.5.5 - D
THE POTABLE WATER SUPPLY TO AN ASPIRATING DEVICE
PROTECTED BY AN ATMOSPHERIC VACUUM BREAKER



NOTES:

1. Atmospheric vacuum breakers are not rated for periods of more than 12 hours under continuous water pressure.

Figure 10.5.5 - E
THE POTABLE WATER SUPPLY TO A WATER CLOSET OR URINAL
PROTECTED BY AN ATMOSPHERIC VACUUM BREAKER

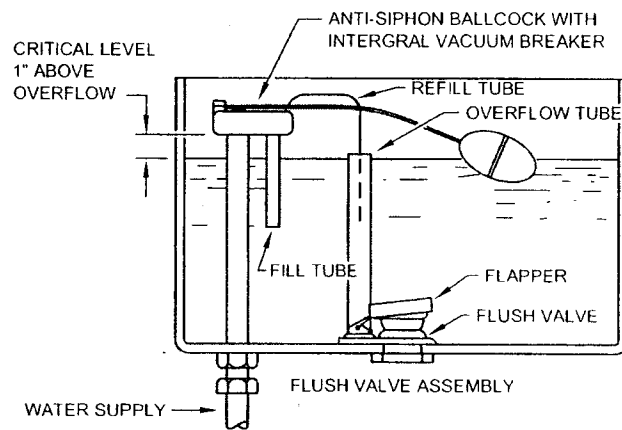
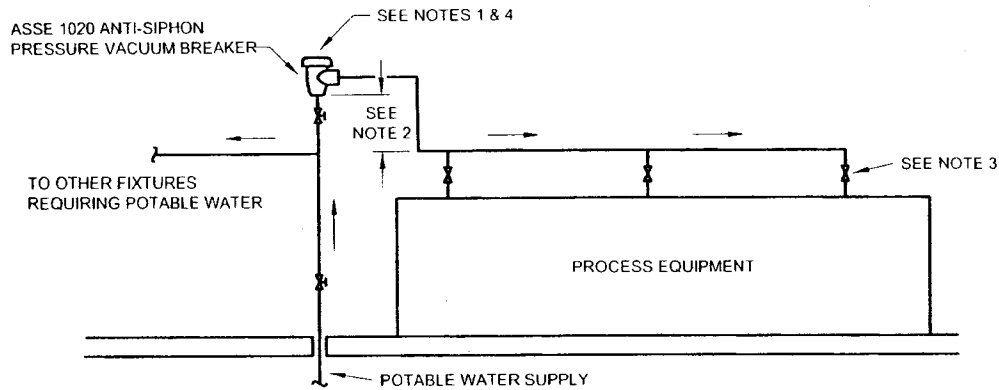


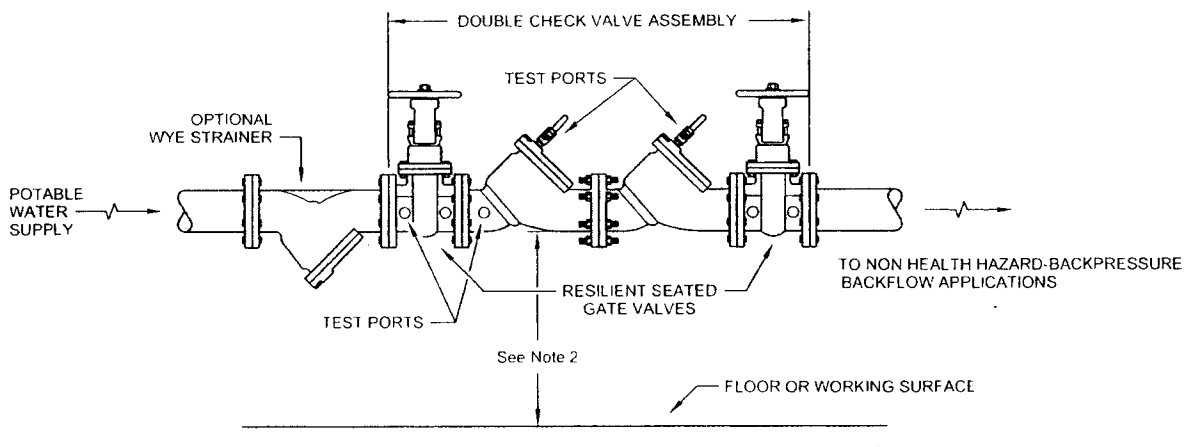
Figure 10.5.5 - F
THE POTABLE WATER SUPPLY TO A WATER CLOSET GRAVITY FLUSH TANK
PROTECTED BY AN ANTI-SIPHON BALLCOCK WITH INTEGRAL VACUUM BREAKER



NOTES:

1. ASSE 1020 anti-siphon pressure vacuum breakers can be located where subjected to continuous pressure.
2. The critical level (C-L) of the vacuum breaker must be at least 12" higher than the highest downstream piping.
3. Shutoff valves are permitted downstream from pressure vacuum breakers.
4. ASSE 1020 pressure vacuum breakers should not be located where water spillage from the atmospheric vent will cause damage or create a nuisance. If necessary, use ASSE 1056 spill-resistant vacuum breakers.

Figure 10.5.5 - G
THE POTABLE WATER SUPPLY TO INDUSTRIAL PROCESS EQUIPMENT
PROTECTED BY AN ANTI-SIPHON PRESSURE VACUUM BREAKER

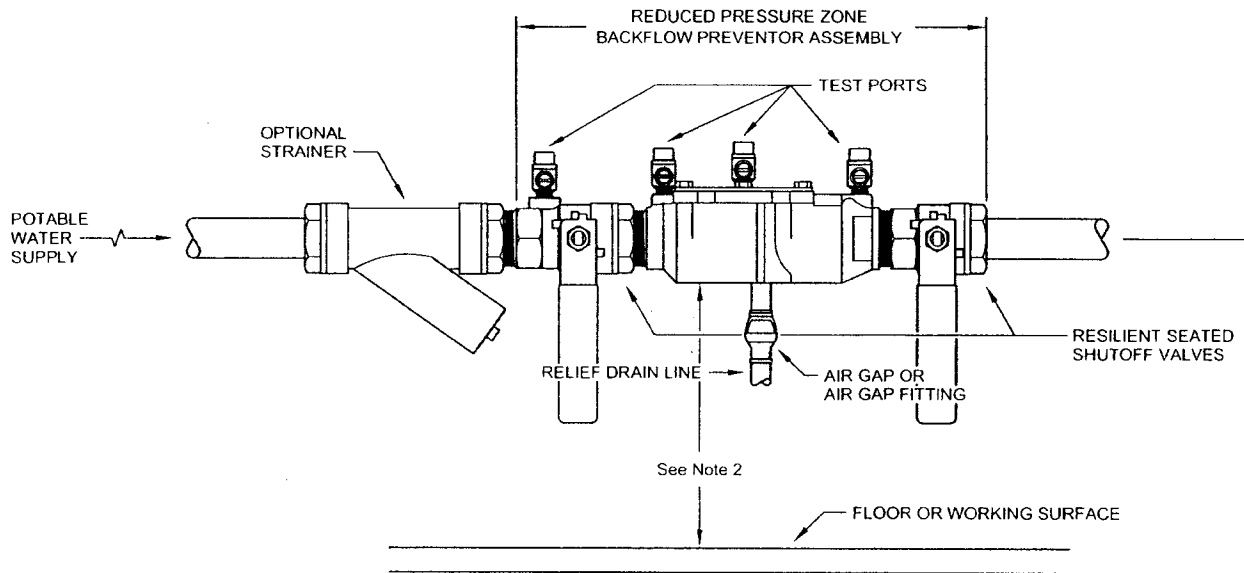


NOTES:

1. Double check valve assemblies or reduced pressure backflow preventor assemblies are required for back pressure applications.
2. Double check valve assemblies must be installed between 12" and 60" above the floor or other working surface to provide sufficient access for periodic testing and maintenance.
3. Double check valve assemblies subject to back-siphonage require an intermediate vacuum breaker and a relief vent.
4. Double check valve assemblies with an intermediate vacuum breaker and relief vent must not be located in pit or other area subject to flooding. The relief vent will create a cross-connection if submerged.

Figure 10.5.5 - H
THE POTABLE WATER SUPPLY TO A NON-HEALTH HAZARD BACKFLOW APPLICATION
PROTECTED BY A DOUBLE CHECK VALVE ASSEMBLY

TO A BACK-PRESSURE HEALTH HAZARD BACKFLOW APPLICATION SUCH AS COOLING TOWER MAKEUP, BOILER WATER MAKEUP, OR HYDRONIC PIPING SYSTEM MAKEUP WHERE CHEMICAL TREATMENT IS PROVIDED AND THE WATER IN THE PIPING SYSTEM IS NOT POTABLE.



NOTES:

1. Double check valve assemblies are not permitted for health hazard applications.
2. Reduced pressure zone principle backflow prevention devices must be installed between 12" and 60" above the floor or other working surface to provide sufficient access for periodic testing and maintenance.
3. RPZ devices must not be installed in pits or other area subject to flooding. The relief vent will create a cross-connection if submerged.
4. If occasional spillage from the relief vent will cause damage or be a nuisance, the vent must be equipped with an air gap fitting and indirectly drained to an acceptable point of disposal.

Figure 10.5.5 - 1
THE POTABLE WATER SUPPLY TO A HEALTH HAZARD BACKFLOW APPLICATION
PROTECTED BY A REDUCED PRESSURE BACKFLOW PREVENTER ASSEMBLY

10.5.6 Maintenance and Testing of Backflow Prevention Devices

- a. Devices installed in a building potable water supply distribution system for protection against backflow shall be maintained in good working condition by the person or persons responsible for the maintenance of the system.
- b. Devices that are designed to be field tested shall be tested prior to final inspection of the initial installation and once each year thereafter, using field test procedures conforming to ASSE 5010 Series Professional Qualifications Standards or equivalent.

NOTE: Testable devices are those backflow prevention devices having test cocks and include, but are not limited, to the following:

1. Pressure vacuum breakers
2. Spill-resistant vacuum breakers
3. Double check valve assemblies
4. Double check detector assemblies
5. Reduced pressure backflow preventer assemblies
6. Reduced pressure detector assemblies

c. Where tests indicate that the device is not functioning properly, it shall be serviced or repaired in accordance with the manufacturer's instructions and be retested.

d. Testing and repair of devices shall be performed by certified individuals approved by an agency acceptable to the Authority Having Jurisdiction. Certification for testing shall be in accordance with ASSE 5000 or equivalent. Certification for repair shall be in accordance with ASSE 5030 or equivalent. Certification shall include not less than 32 hours of combined classroom and practice training and successful completion of a written and practical examination.

e. Copies of test reports for the initial installation shall be sent to the Authority Having Jurisdiction and the water supplier. Copies of annual test reports shall be sent to the water supplier.

f. Where a continuous water supply is critical and cannot be interrupted for the periodic testing of a backflow prevention device, multiple backflow prevention devices or other means of maintaining a continuous supply shall be provided that does not create a potential cross connection.

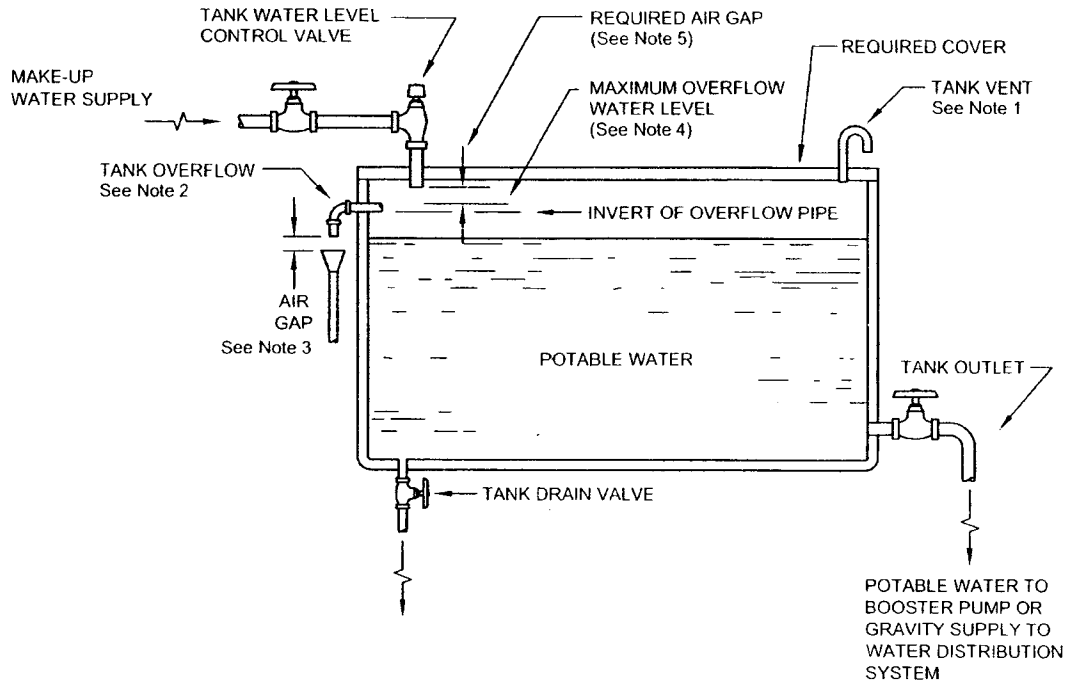
10.5.7 Tanks and Vats—Below Rim Supply

a. Where a potable water outlet terminates below the rim of a tank or vat and the tank, or vat has an overflow of a diameter not less than given in Table 10.8.3, the overflow pipe shall be provided with an air gap as close to the tank as possible.

b. The potable water outlet to the tank or vat shall terminate a distance not less than 1-1/2 times the height to which water can rise in the tank above the top of the overflow. This level shall be established at the maximum flow rate of the supply to the tank or vat and with all outlets closed except the air-gapped overflow outlet.

c. The distance from the outlet to the high water level shall be measured from the critical point of the potable water supply outlet.

See Figure 10.5.7. Also Sections 10.8.3, 10.8.4, 10.8.5, and 10.8.6



NOTES:

1. The covers of potable water tanks or vats must have screened vent pipes with internal areas not less than that of the outlet pipe.
2. The size of the overflow pipe must comply with Table 10.8.3, based on the maximum makeup water flow rate.
3. The air gap at the tank overflow discharge must be 2 X the inside diameter of the overflow pipe.
4. The maximum overflow water level must be established based on the size of the overflow pipe and the maximum available makeup water flow. Calculated required static head or rise above the invert of the overflow should be confirmed by operational tests under actual full flow conditions with the tank outlet(s) closed.
5. The required air gap at the water inlet to the tank or vat must be at least 1-1/2 times the rise in water level above the invert of the overflow outlet under maximum overflow conditions, measured from the invert of the tank overflow.

Figure 10.5.7
A POTABLE WATER TANK OR VAT WITH ITS INLET BELOW THE OVERFLOW RIM

10.5.8 Connections to Carbonated Beverage Dispensers

The water supply to a carbonated beverage dispenser shall be protected against backflow with an integral backflow preventer conforming to ASSE 1032 or an air gap. Carbonated beverage dispensers and carbonated beverage dispensing systems without an integral backflow preventer conforming to ASSE 1032 or an air gap shall have the water supply protected with a double check valve with atmospheric vent conforming to ASSE 1032.

10.5.9 Protection from Fire Systems

a. Potable water supplies to water-based fire protection systems, including but not limited to standpipes and automatic sprinkler systems, shall be protected from back-pressure and back-siphonage by one of the following testable devices:

1. double check fire protection backflow protection assembly - ASSE 1015 (DCF)
2. double check detector fire protection backflow protection assembly - ASSE 1048 (DCDF)
3. reduced pressure principle fire protection backflow prevention assembly - ASSE 1013 (RPF)
4. reduced pressure detector fire protection backflow prevention assembly - ASSE 1047 (RPDF)

EXCEPTIONS

- (1) ASSE 1024 dual check valves in residential sprinkler systems
 - (2) ASSE 1024 dual check valves in limited area sprinkler systems
 - (3) Where fire protection systems include a fire department connection, double check valve assemblies shall not be permitted.
 - (4) Where fire protection systems are filled with solutions that are considered to be health hazards as defined in Section 1.2, double check valve assemblies shall not be permitted.
- b. Whenever a backflow protection device is installed in a potable water supply to a fire protection system, the hydraulic design of the fire protection system shall account for the pressure drop through the backflow protection device.
- c. If backflow protection devices are retrofitted for an existing fire protection system, the hydraulics of the fire protection system shall be checked to verify that there is sufficient water pressure available for satisfactory operation of the fire protection system.

10.5.10 Protection from Lawn Sprinklers and Irrigation Systems

a. Potable water supplies to systems having no pumps or connections for pumping equipment, and no chemical injection or provisions for chemical injection, shall be protected from backflow by one of the following devices:

1. Atmospheric vacuum breaker
2. Pressure vacuum breaker (PVB)
3. Spill-resistant vacuum breaker (SVB)
4. Reduced pressure backflow preventer assembly

b. Where sprinkler and irrigation systems have pumps, connections for pumping equipment, auxiliary air tanks or are otherwise capable of creating back-pressure, the potable water supply shall be protected by the following type of device if the backflow device is located upstream from the source of back-pressure.

1. Reduced pressure backflow preventer assembly

c. Where systems have a backflow device installed downstream from a potable water supply pump or a potable water supply pump connection, the device shall be one of the following:

1. Atmospheric vacuum breaker
2. Pressure vacuum breaker (PVB)
3. Spill-resistant vacuum breaker (SVB)
4. Reduced pressure backflow preventer assembly

d. Where systems include a chemical injector or any provisions for chemical injection, the potable water supply shall be protected by the following:

1. Reduced pressure backflow preventer assembly

10.5.11 Domestic Water Heat Exchangers

a. Heat exchangers used for heat transfer, heat recovery, or solar heating shall protect the potable water system from being contaminated by the heat transfer medium, in accordance with either subparagraph b or c below.

b. Single-wall heat exchangers shall be permitted if they satisfy all of the following requirements:

1. The heat transfer medium is either potable water or contains only substances that are recognized as safe by the U.S. Food and Drug Administration.
2. The pressure of the heat transfer medium is maintained less than the normal minimum operating pressure of the potable water system.