



Keeping your water safe.

CROSS- CONNECTION CONTROL AND BACKFLOW PREVENTION



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Partial List of Typical Cross Connection Hazards		
Facility	Types of Hazards	Recommended Protection
Auxiliary Water Systems	Private water systems, industrial systems swimming pools, cooling systems, fountains, waterfalls and fire fighting systems	Interconnections not allowed and water service connection protected by air gap separation or reduced pressure backflow prevention assembly. Annual internal inspection with required backflow testing
Boilers	Toxic water treatment chemicals such as hydrazine, and less toxic materials such as oxygen scavengers	Air gap separation or reduced pressure backflow prevention assembly. Annual internal inspection with required backflow testing
Hospitals, Clinics, Veterinary Clinics, Sanitariums, Morgues, and Autopsy Facilities	Sewer-connected equipment such as autoclaves, aspirators, and sterilizers hose connections to lab sinks, etc. water cooled equipment boilers and cooling systems	Water service protected by air gap separation or reduced pressure backflow prevention assembly. Annual internal inspection with required backflow testing
Electronics, Plating, Film Processing, and Metal Finishing Facilities	Acids and bases, toxic solutions such as cyanide and heavy metals (cadmium, mercury, chromium, silver, etc.)	Water service protected by air gap separation or reduced pressure backflow prevention assembly. Annual internal inspection with required backflow testing
High Rise Building and Buildings Using Booster Pumps	Suction-side facilities for sewage disposal, sanitation, laboratory or industrial uses higher pressures in system piping	Water service protected by air gap separation or reduced pressure backflow prevention assembly where there is a potential for a health hazard. Double check valve assembly where there is a non-health hazard. Reduced pressure backflow prevention assembly where takeoffs for lower floors are connected to the suction side of the booster pump. Annual internal inspection with required backflow testing
Chemical Plants	Chemical processing units steam and cooling systems	Water service protected by air gap separation or reduced pressure backflow prevention assembly. Annual internal inspection with required backflow testing
Wastewater Treatment Facilities	Wash water, pump seals, water sprayers injector fed water and laboratories	Water service protected by air gap separation or reduced pressure backflow prevention assembly. Annual internal inspection with required backflow testing
Beverage Bottling and Breweries, Canneries, Packing Houses and Rendering Plants	Pressure cookers, Can and bottle washers, storage tanks, canning and bottling machines, cooling, and heating systems, industrial fluids, and steam generating	Water service protected by air gap separation or reduced pressure backflow prevention assembly or double check valve if no health hazard exists. Annual internal inspection with required backflow testing
Plant Nurseries	Fertilizer, herbicides, pesticides, watering systems, and auxiliary water supplies	Water service protected by air gap separation or reduced pressure backflow prevention assembly or double check valve if no health hazard exists. Annual internal inspection with required backflow testing
Laundries	Laundry machines, solvent cleaners, pumping and sewer connections	Water service protected by air gap separation or reduced pressure backflow prevention assembly. Annual internal inspection with required backflow testing
Oil and Gas Facilities	Mud pumps and mud tanks, hydraulic equipment, dehydration tanks, boilers and cooling systems, hydraulic testing of equipment, fire fighting systems, pressurized industrial fluid systems and pressurized gas systems	Water service protected by air gap separation or reduced pressure backflow prevention assembly. Annual internal inspection with required backflow testing
Clothing, Paper, and Paper Products	Bleaching, dyeing, and processing with toxic chemicals, steam and cooling systems, pressurized industrial fluids, fire fighting systems, dye vats with toxic chemicals, blueing, acid washing, and shrinking retention and mixing tanks	Water service protected by air gap separation or reduced pressure backflow prevention assembly. Annual internal inspection with required backflow testing

CROSS-CONNECTION CONTROL AND BACKFLOW PREVENTION

The production and delivery of a safe water is the highest priority for a public water supply system. After a potable water has been produced, precautions must be taken to ensure that it is not contaminated with water, liquids, gases, or corrosion products from other sources.

Almost every water user in the distribution system may have actual or potential hazards. Simply misusing an ordinary garden hose may create a potentially dangerous cross-connection. Private water users may have complex internal water systems, such as would exist at hospitals, large buildings, industrial plants, and food processing facilities. Contaminated backflow into the public water system occurs either through back pressure or back siphonage, from appliances and equipment, or from other water supply sources.

The water user (customer) has a responsibility to protect the safety of the water supply—both on their premises and in the public system. Protection of building plumbing must be done in accordance with the requirements of the adopted plumbing code and local authority having jurisdiction.

Clearly, the water purveyor has the responsibility to protect the public water supply for all of its customers. Therefore, cross-connection control programs generally require backflow prevention assemblies within private water systems as well as backflow prevention devices installed at water service connections. Such duplicate protection devices help to ensure the integrity of the public water system.

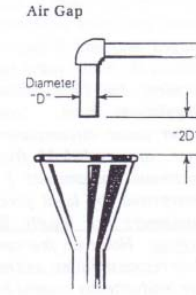
DEFINITIONS

ABPA	The American Backflow Prevention association, P.O. Box 1563, Akron, Ohio 44309-1563
Connection	A single family residential unit or each commercial or industrial establishment to which drinking water is supplied from the system.
Contamination	The presence of any foreign substance (organic, inorganic, radiological, or biological) in water which tends to degrade its quality so as to constitute a hazard or impair the usefulness of the water.
Cross-connection	A physical connection between a public water system and either another supply of unknown or questionable quality, any source which may contain contamination or polluting substances, or any source of water treated to a lesser degree in the treatment process.
Drinking Water	All water distributed by any agency or individual, public or private, for the purpose of human consumption or which may be used in the preparation of foods or beverages or for the cleaning of any utensil or article used in the course of preparation or consumption of food or beverages for human beings. The term "Drinking Water" shall also include all water supplied for human consumption or used by any institution catering to the public.
Health Hazard	Any conditions, devices or practices in the water supply system and/or its operation which create, or may create, a danger to the public health and well-being of the water consumer. An example of a health hazard is a structural defect in the water supply system, whether of location, design, or construction, which may regularly or occasionally prevent satisfactory purification of the water supply or cause it to be contaminated from extraneous sources.
High Health Hazard	A cross-connection, potential cross-connection, or other situation involving any substance that could cause death, illness, spread of disease, or has a high probability of causing such effects if introduced into the portable drinking water supply.
Plumbing Inspector	Any person employed by a political subdivision for the purpose of inspecting plumbing work and installations in connection with health and safety laws and ordinances, who has no financial or advisory interest in any plumbing company, and who has successfully fulfilled the examinations and requirements of the Texas State Board of Plumbing Examiners.
Plumbing Ordinance	A set of rules governing plumbing practices which are at least as stringent and comprehensive as one of the following nationally recognized codes: (a) Southern Standard Plumbing Code, (b) uniform Plumbing Code or (c) National Standard Plumbing Code.
Water Supply Protection Specialist	Any person who holds a license endorsement issued by the Texas Board of Plumbing Examiners to engage in the inspection, in connection with health and safety laws and ordinances, of the plumbing work or installation of a public water system distribution facility or of customer owned plumbing connection to that system's water distribution lines.

BACKFLOW PREVENTION DEVICES

Air Gap

The device used to eliminate a cross-connection is the containment air gap. A properly designed and installed air gap prevents backflow by separating the public water supply from the source of contamination. Air gaps eliminate the cross-connection and do not require mechanical equipment that can fail.



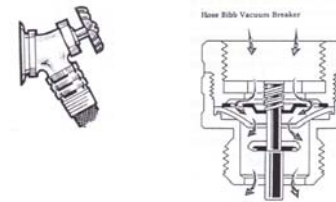
The air gap is provided by a minimum unobstructed vertical separation of two times the inside diameter of the water supply outlet between the discharge end of the water supply pipe and the overflow rim of the vessel. An absolute minimum of one inch must always be maintained. Screened protection over the water supply outlet and the receiving vessel are required to protect both water supplies from the entry of insects or vermin.

The one inch minimum separation is required because water can rise above the flood rim due to surface tension and strong suction can draw water toward the suction source.

Water pressure at the air gap can be restored by using a booster pump with a surge tank.

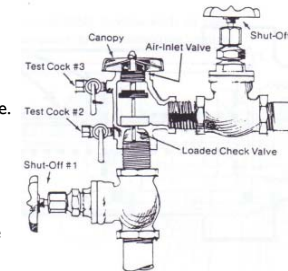
Hose Bibb Vacuum Breakers

This device is an atmospheric vacuum breaker designed for attachment to a hose bibb. It helps to prevent back siphonage through hoses. The hose bibb has the same limitations that apply to atmospheric vacuum breakers. Its one additional limitation is that it can very easily be removed by someone who does not appreciate its importance.



Pressure Vacuum Breaker Assembly

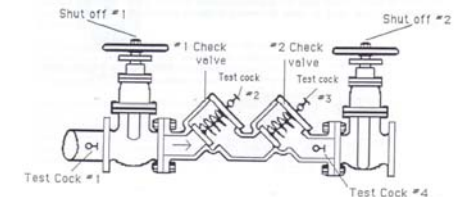
This device is a combination of a single check valve with an atmospheric vacuum breaker. In addition, the assembly has suction and discharge gate valves and test cocks, allowing for full testing of the device.



These devices can be used with downstream shutoff valves, and to protect against back siphonage, but does not give adequate protection against back pressure backflow.

Double Check Valve Assemblies

A double check valve assembly consists of two independently operating check valves with supply and discharge shut-off valves and four test cocks. The check valves allow flow only in the normal direction. The double check valve assembly provides adequate protection against both back pressure backflow and back siphonage, but is not adequate for health hazard situations.



Reduced Pressure Zone Assembly

The reduced pressure zone assembly provides the greatest degree of protection in a mechanical device. It consists of the following:

- two independent, spring-loaded check valves
- a spring-loaded atmospheric vent valve
- shut-off valves on the suction and discharge
- four test cocks

Additional protection is provided by the reduced pressure zone between the two check valves. This creates a pressure gradient within the valve that allows for flow in only one direction. The device can be fully tested, will protect against back pressure backflow and back siphonage and will vent to the atmosphere in the event the first check valve fails.

This device, because of its added protection, is considered to be adequate for both health as well as non-health hazard situations. It is designed to operate under continuous pressure and is the most versatile backflow prevention device.

