



Backflow Prevention FAQ

What are cross connections?

Cross connections are physical connections between a potable water supply and some non-potable source. Potable water is water free of harmful levels of pollutants and contaminants and suitable for public consumption. A non-potable source could be anything from a direct connection to a sewer pipe to a hose dangling in a swimming pool.

Aren't cross connections controlled by the plumbing code?

Plumbing codes do address connections. No cross connections are supposed to be allowed in internal plumbing systems. In addition, several normal cross connection situations, such as boiler feeds, are required to be protected by specific types of backflow preventers.

Notwithstanding the many references in plumbing codes, cross connections are prevalent in the plumbing systems of almost every structure. Potential cross connection situations, in which cross connections can occur with a simple rearranging of plumbing such as placing the hose into the swimming pool, add greatly to the likelihood of cross connection occurrences.

Are cross connections dangerous?

Under normal circumstances, with normal flows and pressures in internal systems, cross connections usually do not affect the potable water quality. When changes take place in the normal water flow or pressure, cross connections can become dangerous. Whatever non-potable source the cross connection is attached to can mix with the potable water. This mix can range from harmless to unpleasant to fatal depending on the nature of the non-potable source.

So cross connection control means the elimination of cross connections?

Partially. Water purveyors as a goal would strive to see the elimination of all cross connections. This elimination would insure the maintenance of the incoming water quality throughout the structure. Water purveyors can reasonably control water quality in distribution systems, but continuously controlling what happens in internal plumbing systems is impossible. Many cross connections are created unknowingly and innocently by simple plumbing rearrangements.

Cross connection control also means the addition of control devices to protect against the occurrence of non-potable substances mixing with the potable.

What does backflow prevention have to do with cross connection control?



Backflow is a hydraulic condition that may occur during several types of events such as hydrant flows, main breaks, or any other system hydraulic imbalance. In many backflows conditions water pressure is lowered at one point in the system, and water at a higher elevation or higher pressure moves in a direction opposite to its normal flow. If backflow occurs where a cross connection to a non-potable substance exists, the substance can enter and pollute the water system.

Backflow prevention involves the installation of devices, backflow preventers, to prevent the consequences of backflow incidents by minimizing the chances of non-potable substances mixing with potable water.

Can't I tell when backflow occurs and take suitable action to minimize the consequences?

Backflow in plumbing systems is often unnoticed. Many times, it happens silently without the knowledge of any resident. It may occur briefly during a pressure fluctuation only to have normalcy restored before notice is taken of the situation. If the normal potable water was contaminated during the low-pressure period, the tainted water may still be present in the internal plumbing of the structure. Even with dilution with the normal water supply, the tainted water, depending on the contaminating substance, may contain enough of that contaminant to present health risks if ingested or if skin contact is made.

What can be done to reduce risks?

Public water purveyors are required to have a cross connection control program in place. Kennebec Water District has such a program. Under KWD's program, each structure is required to have an appropriate backflow prevention device on its service entrance. This policy is known as containment. Containment effectively keeps any contaminants generated by a cross connection in the structure within the structure and out of the public water supply's distribution system. KWD requires different types of backflow preventers based on the degree of hazard potential within the structure. A hospital, with devices such as sterilizers and aspirators connected to the internal water system, requires a top-of-the-line reduced pressure zone (RPZ) device, whereas a normal residence without any special water uses requires a low-end dual check backflow preventer. The devices vary in protective capabilities and in cost.

What if I have no cross connections in my home or business?

Many homes and businesses do contain no apparent cross connections. The potential for development of a cross connection, however, is available in all homes and businesses. This potential risk must be addressed just as an existing physical cross connection must be addressed. KWD is seeking to protect 100% of the services within its distribution system. By completing this program, each structure will be protected from contamination or pollution originating within another structure on the distribution system.



What are the possible cross connections in a residential home?

There are many possibilities for cross connections within residential structures. As mentioned before, the extension of a hose into a non-potable substance, whether it is a pool, a sewer during a flushing procedure, a darkroom or laundry sink, or into any other foreign substance is a typical residential cross connection occurrence. The lawn and garden fertilizer and pesticide unit that attaches directly onto an outside hose is a classic cross connection scenario that has resulted in several documented backflow incidents.

Some household appliances such as garbage disposals and washing machines have direct connections between the potable water system and sewer line or dirty water source. Also, many toilet fill valves, located in the tank of the toilet, are not of the anti-siphon design and may allow tank water to be drawn back into the household plumbing during backflow. Even a PVC garden hose left in the hot summer sun may increase in pressure to force water containing chemicals leached from the plastic hose itself back into the household plumbing.

With the device on my service entrance aren't I still subject to backflow within the building?

Yes. The containment device is intended to protect the public water system. It will act to reduce the occurrence of backflow within the structure as well, but it will not completely prevent backflow from taking place internally. For this reason, knowledge of how backflow occurs and what steps can be taken to reduce the potential for a backflow incident in each building is essential. In industrial and commercial structures some fixture isolation occurs where additional backflow preventers are installed to protect against specific hazards. This fixture isolation can also take place on a residential level and is highly recommended.

In fact, hose bib backflow preventers are an easy way to prevent backflow involving outside hoses. Inspecting the internal plumbing of each structure within a distribution system would be a daunting, impossible task for a water purveyor, and help from individual owners is necessary to control all possibilities.

What is thermal expansion, and what does it have to do with my new backflow preventer?

Thermal expansion is the buildup of pressure within the plumbing system of a structure due to the heating of water. When water is heated it expands. If the water is contained in an enclosed pipe while it is heated, it continues to increase in pressure until something gives. In a household plumbing system with a hot water heater or boiler, water is being heated frequently for the domestic needs of the household. If the pressure increase caused by the water heater's heating action is not relieved in some way – normally by someone opening a faucet on a hot water line – then the pressure continues to increase. When the system pressure reaches the preset level of the temperature /pressure (T/P) relief



valve required with each hot water tank or boiler, the relief valve opens and exhausts water until pressure returns to normal. The pressure increase is directly attributable to thermal expansion.

In a system without a containment backflow preventer, the expanded water from the hot water heater would be forced back out into the distribution main. The pressure buildup would not occur. With a containment backflow device in place, however, the pressure is most likely trapped within the structure's plumbing. Pressure relief through the T/P relief valve may occur.

A thermal expansion tank may be added to the internal plumbing system to control the pressure buildup in the plumbing and eliminate concerns with the operation of the T/P relief valve. The expansion tank absorbs the expanded water and allows the system to remain at a reasonable pressure.

How do I know if my device is working?

There are testing procedures to determine if devices are functioning as they should. For the more complex devices, a differential pressure gauge and specialized testing procedures are necessary. These must be checked when installed and at least annually thereafter by a certified tester.

Have there really been documented cases of backflow incidents or is this just another overblown regulatory maneuver?

Numerous backflow incidents occur annually. Many do not get publicized for a variety of reasons. Many are not recognized as backflow incidents. But there is a continuous flow of documentation on many cases of fatalities or serious injury due to cross connections.

The cancellation of the Holy Cross football season many years ago was due to a cross connection to an unsafe source. Cases of Legionnaire's disease have been traced to cooling tower cross connections. Several cases of illness or death due to the use of fertilizer and pesticide attachments to outside hoses have been noted.

Locally, the contamination of the Norridgewock public water supplies a few years ago was traced to a cross connection in an in-town restaurant. Even in KWD's system, we have seen backflow incidents (backflow of carbonic acid in a post-mix carbonated soda machine and an unsightly incident involving a water-cooled compressed air unit in which a buildup of air pressure caused the eruption of a flush valve toilet were two past incidents).

There are opportunities for backflow incidents daily in water systems everywhere due to normal operations of the systems. Cross connection control and backflow prevention are the methods used to ensure that the backflow conditions do not result in contamination of potable water supplies.