

Many people around the world take clean drinking water for granted. In the United States, public drinking water is generally safe and clean, but when contaminated, it could be deadly. Centers for Disease Control and Prevention show 32 drinking water associated illness outbreaks from 2011 – 2012. Those 32 incidents caused at least 31 cases of illness, 102 hospitalizations, and 14 deaths. The US Environmental Protection Agency estimates that only a small percentage of total backflow incidents are actually reported. Contamination of a public water supply can occur when pipes are improperly installed, or when a hose is connected to a non-potable water source. Not every backflow incident results in illness, but every incident poses a threat.

### What is a Cross-Connection?

Cross-Connection means any actual or potential physical connection between a public water system or the consumer's water system and any source of non-potable liquid, solid or gas that could contaminate the potable water supply by backflow.

With modern drinking water systems, cross-connections are a necessity in a pressure piping system, and cannot be completely eliminated. Therefore, a means of protecting the drinking water system from contamination is essential. Backflow protection devices are available for all applications.

Unwanted cross-connections can result in serious health consequences. There have been many documented cases tracing serious disease outbreaks directly to a cross-connection and backflow condition in a potable water system. A large amount of these cases are linked predominantly to underground sprinkler systems (including pop-up sprinklers), submerged hoses, and conditions at or near commercial facilities with high-hazard non-potable uses such as hospitals and industrial facilities.

### How Does a Cross-Connection Occur?

For a drinking water supply to become contaminated via a cross-connection, three things need to happen simultaneously:

1. The potable water supply piping must be unprotected (or improperly protected from a cross connection);
2. A physical cross-connection must be made between the potable water supply piping and a contaminant source; and
3. Backflow conditions must occur.



### What is Backflow?

Backflow is the undesirable reversal of the flow of from a possible source of contamination (water or mixture of water and other liquids, gasses, or other substances) into the potable water system.

### When and How Does Backflow Occur?

Backflow is caused by pressure changes, including conditions of gravity, vacuum or other pressure changes. Two factors contribute to the reversal of flow in pipelines – back-siphonage and back-pressure.

### What is Back-siphonage?

Back-siphonage conditions exist when there is a negative or sub-atmospheric pressure in the supply piping, allowing downstream substances to be siphoned into the potable water supply. The effect is similar to drinking water through a straw. An example of back siphonage is when the water pressure coming into your home suddenly drops such as during a water main break or firefighting efforts utilizing fire hydrants, a siphon is created and contaminated water can be drawn back into previously clean water supplies (i.e., an underground water main or a private well).

### Consequences of Backflow via Back-Siphonage

- A toilet flush valve without an anti-siphon device can permit toilet odors, vapors, and worse, to get into household plumbing and the water you drink.
- If a garden hose is used to clean out sewer lines or rain gutter downspouts, a drop in pressure can cause contamination from those sources to be drawn back into your water supply.
- Similarly, water being used to fill a swimming pool can be drawn back into the water supply during pressure drops, bringing contamination with it.
- If an insecticide spray attachment is used on a garden hose, backflow can cause potentially lethal contamination of water supplies.

### What is Back-pressure?

Back-pressure can occur when the pressure in an unprotected piping system on the customer side exceeds the pressure from the supply side of the potable water system. Examples include booster pumps, pressure vessels and elevated plumbing. If a pump used on a non-potable water source were

accidentally connected to the potable water supply, the contaminated/polluted water could be pumped into the facilities potable water supply and the public water system.

**Backflow** can cause our drinking water to become polluted or contaminated.

**Pollution** reduces the quality of the drinking water. It does not create a public health hazard, but adversely affects the aesthetics of taste, odor and appearance.

**Contamination**, however, poses a public health risk through poisoning and the spread of disease.

#### Sources of Backflow

Backflow can occur wherever there are potential cross-connections in a water system. Potential cross-connections include:

Kitchen: dishwashers, garbage disposals

Bathroom: toilets, hand-held shower heads, steam bath generators, bath whirlpool devices

Faucets: hose bibs, sill cocks, or any faucet where a hose can be attached

Outdoors: swimming and wading pools, fish ponds, fountains, lawn irrigation systems

Hoses are a special problem and wherever they are attached to a threaded faucet, a potential backflow hazard exists.

- Irrigation or lawn sprinkler systems
- Lawn chemical application equipment
- Boilers
- Pools and spas
- Water or other fluid pumps
- Auxiliary water supplies (drilled wells, water storage tanks, etc.)
- Gray water systems
- Fire sprinkler systems (not including approved flow-through systems)