WATTS®

Water Safety: Protecting Our Communities from Backflow Incidents

Protecting the Safe Water Standard

The water industry's successful efforts in developing standards for water quality have made potable water a public right and expectation. Water flowing from a faucet, whether commercial or residential, is expected to be clean and safe. As water professionals, we are responsible for maintaining these standards and continuing to provide communities with safe, potable water. Despite our best efforts, there will always be an underlying threat to these safety standards, coming in the form of backflow. Plumbing cross-connections put our water system in danger of contamination. Nevertheless, we have a reputation to uphold and protect and an obligation to keep our communities safe. It is critical that we, as knowledgeable and trusted professionals, stay up-to-date on the changing demands of our plumbing systems and do all we can to ensure that our water systems stay safe.

> It is our responsibility as water professionals to maintain standards and continue to provide communities with safe, potable water.

Questions & Answers

BACKFLOW PREVENTION

Q What is backflow? Defining and identifying the lurking threat to our water supply.

A Our first step in identifying and correcting backflow is defining the problem and exploring high-risk situations. Backflow is the unwanted and dangerous reverse flow of liquid, gas, or another substance into a potable water distribution system. Due to the complex and unique nature of each plumbing system, backflow problems are typically not identified until serious symptoms arise. According to the EPA, "most backflow incidents are generally detected and reported to the local authority only if customers detect an irregularity in their water supply…but not all contamination that produces illness and disease can be detected by taste, color, or odor." Even when backflow incidents are detected, some experts "suspect that there may be 10 times as many incidents as are reported," making our responsibility to protect our communities even more relevant.

A cross-connection is any actual or potential connection or structural arrangement between a public or a consumer's potable system and any other source or system through which it is possible to introduce into any part of the potable system any used water, industrial fluid, gas, or substance other than the intended potable water with which the system is supplied. Bypass arrangements, jumper connections, removable sections, swivel or change-over devices, and other temporary or permanent devices through which or because of which backflow can occur are considered cross-connections.

Two types of backflow: backpressure and backsiphonage

Backpressure and backsiphonage are two ways in which backflow can occur. Backpressure occurs when downstream water pressure of a non-potable system surpasses the pressure of the water distribution lines containing potable water.

Backsiphonage happens when normal flow is reversed because of negative or sub-atmospheric pressure in a piping system. An example is the pressure created when drinking through a straw to reverse natural flow by creating a vacuum with your mouth and the straw.

Common causes of backpressure and backsiphonage come from interruptions in the water supply that can happen in situations such as water-line flushing, firefighting events, water-main breaks, installation of heating systems, installation of elevators, or the installation or repair of any other pressure-producing or -altering systems.

Two Case Descriptions: A 1986 Alabama case represents the hidden dangers of backflow incidents. A local man was chemically burned by his shower water after sodium hydroxide made its way into the water supply from a chemical tank being used for a nearby project. Because a worker did not take the necessary steps to prevent the backsiphonage of chemicals, sodium hydroxide was introduced into the potable water supply. Had precautions been taken to ensure the safety and quality of his plumbing connections, this incident could have been prevented.

In October 2010, drinking water at Bristow Elementary School in Bowling Green, Kentucky, was contaminated when glycol, a chemical used in the school's heating and cooling system, leaked into the school's drinking supply. A contractor working on the school's HVAC system had attempted to pump water from the school's drinking supply into geothermal pipes. Backpressure in those pipes caused water to back up and push a small amount of chemicals into the school's drinking supply. Some students experienced nausea and other symptoms and were advised to drink milk and seek medical attention if their symptoms persisted. The incident identified the need for a backflow prevention system to prevent similar incidents.

Q How is backflow prevented, and what safeguards are in place?

A Local plumbing codes developed and enforced by organizations like municipalities, water purveyors, and plumbing inspectors are the key safeguards against backflow dangers. Municipalities provide the expertise in backflow prevention by viewing plumbing through a broad lens of the community need. They recognize that every cross-connection has the potential to involve a backflow event. Like vaccination programs, the system works only when it is implemented widely and enforced relentlessly. If these practices and standards are relaxed or ignored, there can be severe and widespread consequences.

494*

The average hours of labor to remedy a backflow event

(that's 2 months of work on an average 8 hour work day)

TIME IS MONEY

The average cost to fix a backflow incident

$14,800*

* EPA. Potential Contamination Due to Cross-Connections and Backflow and the Associated Health Risks. 2001

Q What does this mean for plumbing professionals? How can we be part of the solution and maintain standards?

A Plumbers and engineers are the hidden heroes of the community, keeping it safe from the dangers of backflow. We are good stewards of the water system and work tirelessly to maintain the reputation we've created. The threat of backflow puts our reputations on the line every time we go to work.

We can uphold safe-water standards by identifying and diagnosing potential backflow situations, examining plumbing systems and city design, inspecting existing preventers and ensuring they are up to code, providing the highest-quality backflow prevention devices in new buildings and projects, and staying up-to-date on local regulations.

Garden hoses are one of the leading causes of backsiphonage, causing 80 percent of all backflow incidents in the U.S. For that reason, attaching a hose-bibb vacuum breaker to all hoses is standard practice. In these cases, the hose is usually connected at one end to a potable water system, while the other end can be submerged in a non-potable supply like a pool, bottom-fed tank, or boiler. Backsiphonage could introduce the non-potable substance into the potable plumbing system. A garden hose may seem like a benign plumbing connection, but this common connection further illustrates that backflow threats lurk everywhere.

Backflow Prevention and Choosing the Right Solutions

Backflow is not only a threat to the health of our community, it can also cause damage to our environment. The EPA recognizes that backflow incidents can cause issues such as corrosion, harmful microbial growth in our distribution systems, taste, odor, and color issues that create distrustful and skeptical consumers.

Backflow risks are described as one of two types of hazards. A non-health hazard involves a pollutant, a non-toxic substance that may be a nuisance or annoyance but does not pose a threat to human health. A health hazard involves a toxic substance, or contaminant, that could cause water consumers to become ill or contract a disease. Selection of backflow prevention tools depends on which risk is present.

BACKFLOW PREVENTION TOOLS FALL INTO TWO CATEGORIES: TESTABLE AND NON-TESTABLE.

Testable Backflow Preventers

On the more hazardous cross-connection applications, backflow prevention assemblies are required. To verify that they are working properly, annual testing is necessary – and is generally required by federal, state, and local requirements and the manufacturer's product listing with third-party agencies. The working components of a backflow prevention assembly are susceptible to problems caused by sediment and debris and are expected to need service or replacement periodically.

When testing shows a problem with an assembly, it must be addressed. In some cases, cleaning will be sufficient; in others, the assembly will have to be rebuilt. After either remedy, the assembly should be retested to ensure the problem was eliminated. Assemblies that are irreparable and obsolete require replacement.

Non-testable Backflow Preventers

Non-testable backflow prevention devices are generally required on less hazardous cross-connection applications. Some must be replaced periodically, and others will work as long as the fixture they serve is in use or until they visibly fail (leak externally).

Backflow

[bak-floh]

(N.) THE UNWANTED FLOW OF CONTAMINANTS OR POLLUTANTS BECAUSE OF A PRESSURE DIFFERENTIAL.

1

BACKSIPHONAGE

Happens when there is a loss in pressure from the supplying source, creating a vacuum that allows contaminant or pollutants into a potable-water supply.

2

BACKPRESSURE

Happens when the water pressure of the recipient exceeds the source's water pressure, reversing direction of proper water flow.

High-risk Applications

Kitchen

Dishwashers, garbage disposals, ice makers, carbonated beverage dispensers

Bathroom

Toilets, handheld shower heads, steam-bath generators, bath whirlpool devices

Faucets

Hose bibbs, sill cocks, any faucet where a hose can be attached

Outdoors

Swimming pools, fish ponds, lawn irrigation systems

Industrial/Municipal/Commercial

Cooling towers, elevated piping, industrial supply piping, car washes, chemical-feed pumps, lab sinks, fire suppression systems, washing machines, mortuaries, boilers

High-risk Situations

- Water-line flushing
- Water-main breaks
- Firefighting events
- Hilly terrain
- Power loss
- Installation of heating systems
- Installation or repair of any other pressure-producing or pressure-altering system
- High consumer demand
- Tank-cleaning activities

The 10 solutions to backflow prevention

It is important to use the most appropriate solution to safeguard against backflow.

1

AIR GAP

APPLICATION HEALTH HAZARD

An air gap is the empty space that is the vertical distance between the point where water enters a plumbing fixture and the level at which it would overflow, often called "nature's backflow preventer." An air gap provides protection from backpressure and backsiphonage through elimination of the physical connection or structural arrangement from potable service to downstream application.

Example: toilet ballcock, faucet, dishwasher

2

ATMOSPHERIC-TYPE VACUUM BREAKERS (AVB)

APPLICATION HEALTH HAZARD | NON-CONTINUOUS PRESSURE | NON-TESTABLE

AVBs protect potable water supplies by introducing a vent to atomosphere when supply pressure is lost. AVBs ensure that the contaminated water always flows downstream.

Examples: laboratory faucet equipment, lawn sprinkler systems, dishwashers, inlet tank feeds, parlor sinks, sump dispensers

3

HOSE-BIBB VACUUM BREAKER (HBVB)

APPLICATION HEALTH HAZARD | NON-CONTINUOUS PRESSURE | NON-TESTABLE

A type of AVB, a hose-bibb vacuum breaker isolates the hose application to safeguard the potable water system from backsiphonage conditions.

Examples: Attached to sill cocks, threaded faucets, service sinks, manifold shower heads

4

PRESSURE VACUUM BREAKERS (PVB)

APPLICATION HEALTH HAZARD | CONTINUOUS PRESSURE | TESTABLE

PVBs consist of an independently operating spring-loaded check valve and an independently operating spring-loaded air-inlet valve located on the discharge side of the check valve. They are effective against backsiphonage only and are used mainly to isolate health hazards where atmospheric vacuum breakers are not applicable because of downstream valving.

Examples: Multi-zone lawn sprinklers, lab equipment, dishwashers

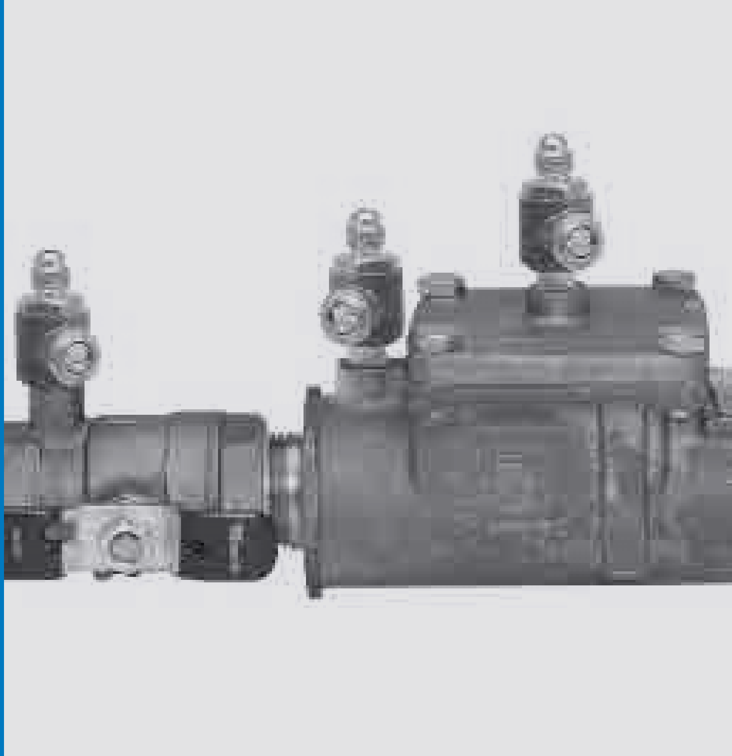
5

DOUBLE CHECK VALVE ASSEMBLIES (DC)

APPLICATION GENERAL HAZARD | CONTINUOUS PRESSURE | TESTABLE

Double check valve assemblies are made up of two independent, spring-loaded check valves and include test cocks and shutoff valves on both ends of the assembly.

Examples: Fire suppression systems, main supply lines, lawn sprinklers, and commercial pools



6

REDUCED PRESSURE ZONE ASSEMBLIES (RPZ)

APPLICATION HEALTH HAZARD | CONTINUOUS PRESSURE | TESTABLE

Reduced Pressure Zone Assemblies are used on direct connections exposed to backpressure and backsiphonage. An RPZ is made up of two independent check valves with an intermediate relief valve.

Examples: Commerical boiler feed lines, hospital and lab equipment, car washes

7

DOUBLE CHECK DETECTOR BACKFLOW PREVENTION ASSEMBLY (DCDA)

APPLICATION GENERAL HAZARD | CONTINUOUS PRESSURE | TESTABLE

A double check detector backflow prevention assembly is composed of a line-size approved double check valve assembly with a bypass containing a specific water meter and an approved double check valve assembly. The meter is used to detect ground leaks and unauthorized illegal taps, which can significantly reduce annual water expenses.

Example: Primarily on fire suppresion systems

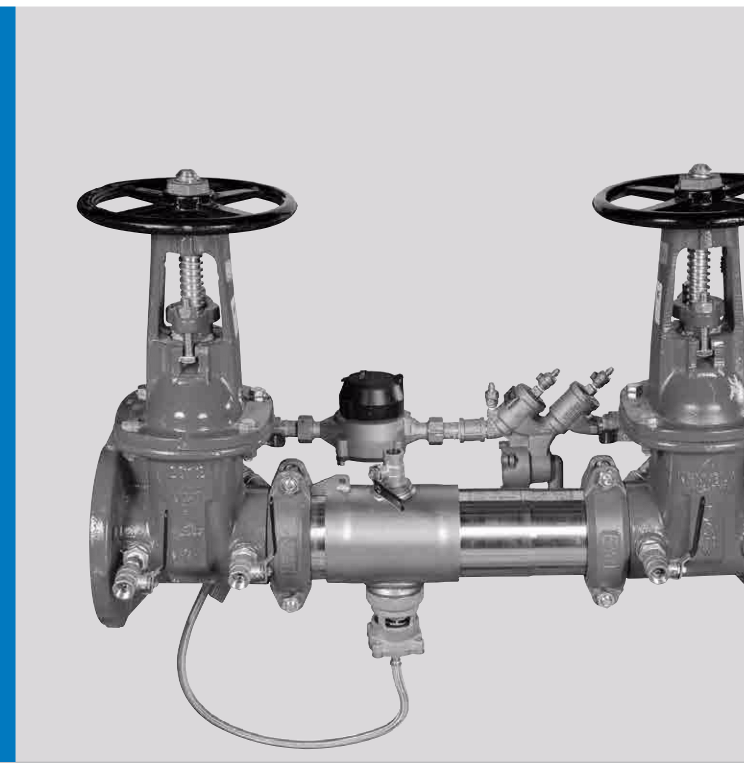
8

REDUCED PRESSURE DETECTOR BACKFLOW PREVENTION ASSEMBLY (RPDA)

APPLICATION HEALTH HAZARD | CONTINUOUS PRESSURE | TESTABLE

A Reduced Pressure Detector Backflow Prevention Assembly is composed of a line-size approved reduced pressure backflow prevention assembly. It has a specific bypass containing a water meter and an approved reduced pressure principle backflow prevention assembly. The meter is used to detect ground leaks and unauthorized illegal taps, which can significantly reduce annual water expenses.

Example: Primarily used on fire suppression systems where additives or foaming agents are used



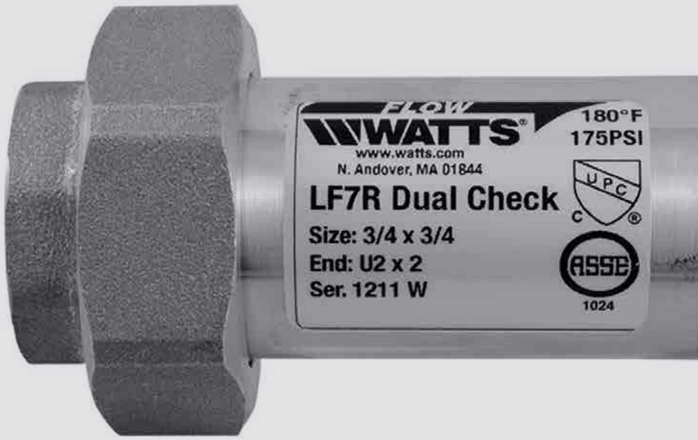
9

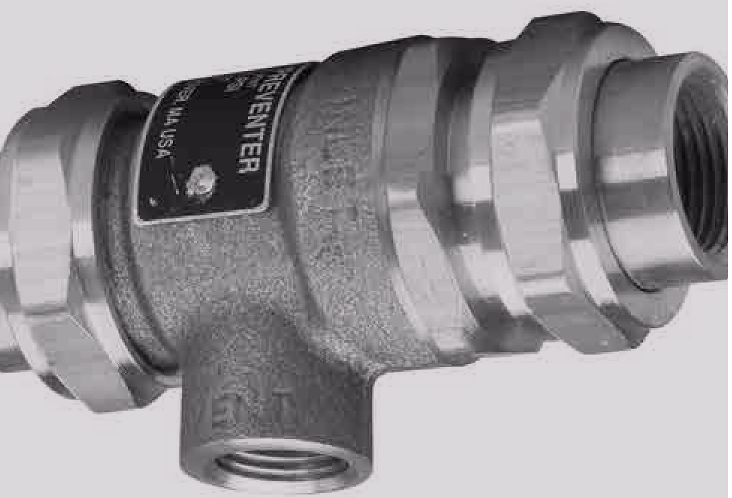
DUAL CHECK VALVE (DuC)

APPLICATION GENERAL HAZARD | CONTINUOUS PRESSURE | NON-TESTABLE

An assembly includes two independent check valves.

Examples: Residential and light commercial potable water supply lines, hose bibs, beverage machinery, commercial ice cream makers





10

VENTED DUAL CHECK VALVE (DCAP)

APPLICATION GENERAL HAZARD | CONTINUOUS PRESSURE | NON-TESTABLE

An assembly includes two independent check valves with an intermediate vacuum breaker relief vent.

Example: Boiler feed lines, laboratory faucets, processing tanks, sterilizers, dairy equipment, barber and beauty parlor sinks

Resources

AMERICAN BACKFLOW PREVENTION ASSOCIATION | ABPA
abpa.org

AMERICAN NATIONAL STANDARDS INSTITUTE | ANSI
ansi.org

AMERICAN SOCIETY OF MECHANICAL ENGINEERS | ASME
asme.org

AMERICAN SOCIETY OF SANITARY ENGINEERING | ASSE
asse-plumbing.org

AMERICAN WATER WORKS ASSOCIATION | AWWA
awwa.org

CANADIAN STANDARDS ASSOCIATION | CSA
csagroup.org

CROSS-CONNECTION CONTROL MANUAL,
United States Environmental Protection Agency, 2003.
epa.gov

ENVIRONMENTAL PROTECTION AGENCY | EPA
epa.gov

FACTORY MUTUAL | FM
fmglobal.com

FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH | USC - FCCCHR
fccchr.usc.edu

INTERNATIONAL ASSOCIATION OF PLUMBING & MECHANICAL OFFICIALS | IAPMO
iapmo.org

NATIONAL SANITATION FOUNDATION | NSF
nsf.org

UNDERWRITERS LABORATORIES INC | UL/cUL
ul.com

TOGETHER, THREE WATTS BRANDS PROVIDE SOLUTIONS FOR A BROAD ARRAY OF BACKFLOW PREVENTION APPLICATIONS.

