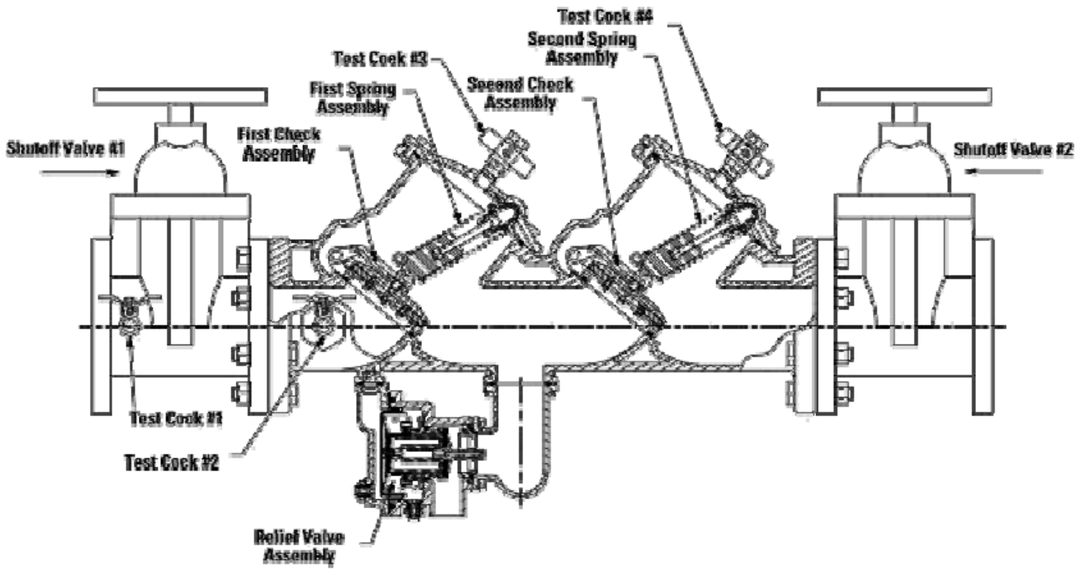
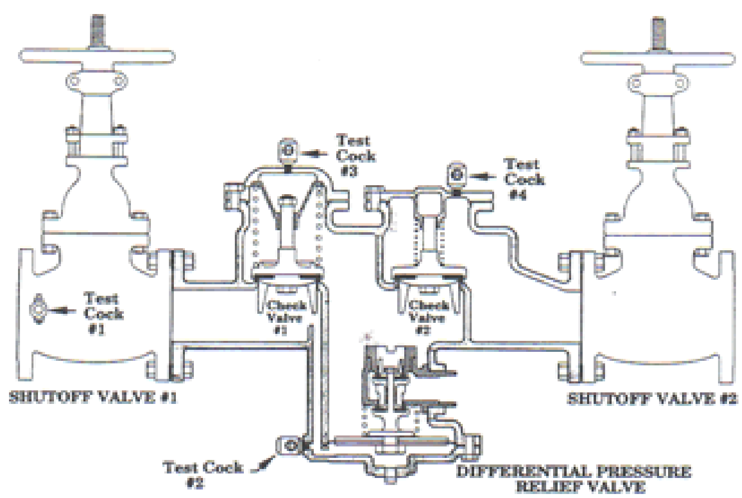
New Systems Information on Cross Connection Control





Based on MSDH bulletin New Systems Onformation on Cross Connection Control
October 2002

MISSISSIPPI STATE DEPARTMENT OF HEALTH
DIVISION OF WATER SUPPLY
2001 CROSS CONNECTION CONTROL PROGRAM

INTRODUCTION

House Bill 692 was signed into law April 16, 2001, changing the existing cross connection regulations. A summary of these changes are provided below:

1. House bill 692 creates a new category of cross connection- " low hazard posing a very low risk". Low hazard-low risk cross connection are considered exempt from all cross connection regulations- backflow preventers cannot be required at these locations. House Bill 692 defines low haz.ard cross connections posing a very low risk as:

   a) Any lawn sprinkler system or lawn irrigation system that is connected to a public water system and was professionally installed regardless of whether the system is underground or above ground or whether the system has pop-up sprinkler heads. **Backflow protection cannot be required for any lawn irrigation system, commercial or residential, unless the sprinkler system is used to apply chemicals or is connected to a wastewater system**.

   b) Any swimming pool that is connected to a public water system and was professionally installed or any swimming pool that is connected to a public water system and has a fill line with an anti-siphon air gap."

   c) Any water fountain or cooler that provides drinking water for human consumption, that is connected to a public water system and was professionally installed."

   d) Any fire sprinkler system that contains only water or a dry pipe and no chemicals that is connected to a public water system and was professionally installed. **Backflow protection cannot be required for fire sprinkler systems unless the sprinkler system contains chemical additives.**

   e) Any commercial establishment that is connected to a public water system that contains no cross connections directly with a dangerous or hazardous substance or material. **Backflow preventers cannot be required for all commercial meters- a cross connection must exist before requiring backflow protection.**

"Professionally installed" is defined as installed in a workmanlike manner with no apparent errors in installation.

2. Lawn sprinkler systems with chemical injection or lawn irrigation systems connected to wastewater systems are still classified as high hazard cross connections. Backflow preventers are required on these lawn sprinkler systems.

3. Additional backflow preventers cannot be required on carbonated beverage dispensers if an ASSE 1022 backflow preventer or air gap is present and piping downstream from the device is not affected by carbon dioxide gas . .

4. Existing backflow preventers (installed before April 16, 2001) are no longer initially tested to ensure they are functioning properly. Backflow preventers installed before April 16, 2001 protecting high hazard cross connections still require annual testing.

5. Property owners are no longer required to install "approved" backflow preventers. The Department will continue to publish a list of "recommended" backflow preventers.

6. Double-check valves protecting low hazard cross connections no longer require initial or annual testing.

7. The maximum fee of $50 for testing double check valves is removed since they are no longer tested.

8. House Bill 692 also prohibits any public water system from adopting policies or ordinances that contain any provisions more stringent than this legislation.

Water systems cannot enforce any ordinance or policy in conflict with the new requirements for cross connection control.

The Mississippi State Board of Health, at its 11 July 2001 meeting, adopted amendments to its cross connection control regulation to reflect the changes required by House Bill 692.

These changes have shifted the focus of Mississippi's Cross Connection Control Program, but cross connection control is still an important tool for water systems to use in ensuring that safe, clean water is provided to every customer.

Because the requirement for routine testing of Double Check Valves has been removed, it is doubtful that many low hazard devices will be installed. However, emphasis is still placed on each water system finding, eliminating, and preventing high hazard cross connections. This manual supersedes previous versions to conform to current regulations.

MISSISSIPPI STATE DEPARTMENT OF HEALTH
DIVISION OF WATER SUPPLY
CROSS CONNECTION CONTROL PROGRAM
REFERENCE MANUAL

Drinking water provided by public water systems in Mississippi arrives at the customers tap clean and safe. This water will be used in many ways, both potable and non potable. Some water may be used in a way that makes it unfit to drink- for example- mixing chemicals at an industry or watering livestock. A cross connection control program makes sure the water being used by a customer does not re-enter the water supply's distribution system where it will be delivered to the next customer. Every public water system in Mississippi is required by law to implement a Cross Connection Control Program.

CROSS CONNECTIONS AND BACKFLOW

A cross connection is any arrangement of piping where a potable water line is connected to potentially contaminated water. A cross connection is either a pipe-to-pipe connection, where potable and contaminated water are directly connected, or a pipe-to-water connection, where the potable water outlet is submerged in contaminated water. Backflow occurs when the direction of flow is reversed and contaminated water moves through the cross connection and into the potable water supply.

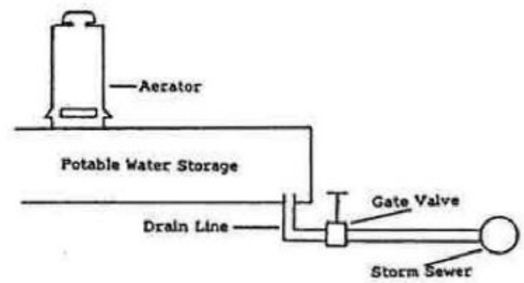


FIGURE 1: Pipe-to-Pipe Cross Connection *A cross connection is created when the drain line is connected to the storm sewer.*

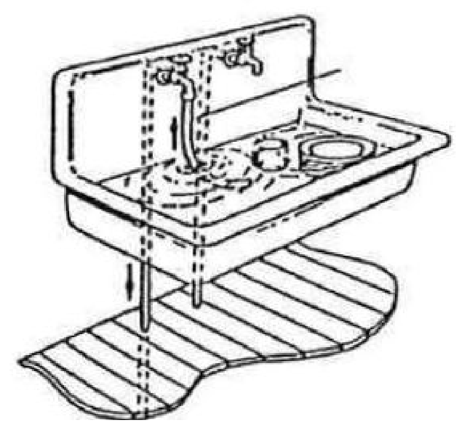


FIGURE 2: Pipe to Water Cross Connection. *A cross connection is created when the hose is submerged in water in the sink.*

Backflow is caused by back pressure or backsiphonage. Back pressure backflow occurs when pressure in the contaminated system is higher than the pressure in the potable system. This can happen when non-potable wat6er is being pumped or stored at a higher elevation.

If the pressure in the potable system drops below the pressure in the non-potable system, the non-potable water pushes into the potable system.

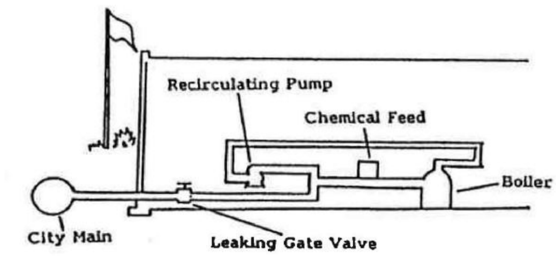


FIGURE 3: Back Pressure Backflow. *The recirculating pump for this boiler system will push water treated with corrosion inhibitors through the leaking gate valve into the city water supply.*

Backsiphonage backflow results from a vacuum being created in a water line. The vacuum draws contaminated water into the potable supply. Breaks or repairs on a main water line or changes in flow due to fire fighting can create a vacuum in a water distribution system.

High and Low Hazard Cross Connections

Cross connections are classified according to the risk they A high hazard cross connection has the potential to allow a contaminant into the potable distribution system that may cause illness or death

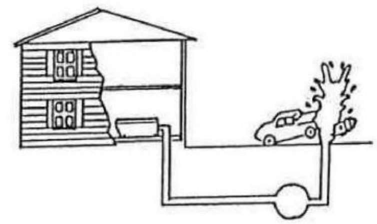


FIGURE 4: Backsiphonage Backflow. *The increased flow from the broken fire hydrant causes a vacuum in the service line and draws water from the bathtub through the submerged inlet into the distribution system.*

Some examples of high hazard contaminants are:

- Oil and gasoline
- Propane gas
- Anti-freeze
- Corrosion inhibitors
- E. Coli

A **low hazard** cross connection has the potential to allow a substance into the potable distribution system that is not harmful to health, but would still be objectionable.

Some examples of low hazard pollutants are:

- Iron
- Manganese
- Sand
- Stagnant water

Low hazard posing very low risk cross connections includes specific cross connections exempted by state law from any regulation. These are defined as:

a) Any lawn sprinkler system or lawn irrigation system that is connected to a public water system and was professionally installed regardless of whether the system is underground or above ground or whether the system has pop-up sprinkler heads.

This means backflow protection cannot be required for any lawn irrigation system, commercial or residential, unless the sprinkler system is used to apply chemicals or is connected to a wastewater system.

b) Any swimming pool that is connected to a public water system and was professionally installed or any swimming pool that is connected to a public water system and has a fill line with an antisiphon air gap.

c) Any water fountain or cooler that provides drinking water for human consumption, that is connected to a public water system and was professionally installed.

d) Any fire sprinkler system that contains only water or a dry pipe and no chemicals that is connected to a public water system and was professionally installed.

Backflow protection cannot be required for fire sprinkler systems unless the sprinkler system contains chemical additives.

e) "Any commercial establishment that is connected to a public water system that contains no cross connections directly with a dangerous or hazardous substance or material."

Backflow preventers cannot be required for all commercial meters - a cross connection must exist before requiring backflow protection.

BACKFLOW PREVENTION

There are five basic appliances that can be installed to protect a water system from backflow through a cross connection:

- Air gap (AG)
- Atmospheric vacuum breaker (A VB)
- Pressure vacuum breaker (PVB)
- Double check valve assembly (DCV A)
- Reduced pressure principle backflow preventer (RP)

Each device has a specific use.

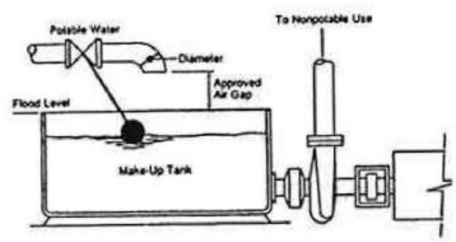


FIGURE 5 Air Gap

AIR GAP

An air gap (AG) physically separates potable water from contaminated water with an air space **(Figure 5)**. It is created when the inlet pipe stops above the rim of the container being filled. The distance between the supply pipe and the overflow rim of the receiving vessel should be two times the diameter of the supply pipe, but never less than one inch. A properly constructed air gap is the safest way to prevent backflow. An air gap protects against both back-siphonage and back pressure. It is appropriate for low and high hazard applications. An air gap is the only protection allowed when water lines must come in contact with sewer or storm sewer lines.

It can be used with any installation that doesn't require a solid physical connection, such as:

- Open spigots
- Surge tanks
- Watering stations

Air gaps should be inspected periodically to make sure a hose hasn't been added, extending the end of the water line into the receiving vessel. Air gaps do not require annual testing.

Atmospheric Vacuum Breaker

An atmospheric vacuum breaker (A VB) is a device that uses an air inlet to prevent back-siphonage (Figure 6). When potable water is flowing in the normal direction, the force of the water is used to seal off the air inlet, allowing water to flow through the device. When the flow stops, the loss of water pressure permits the air inlet valve to drop. This seals off the supply line and opens the air inlet vent, allowing air into the system. This keeps a vacuum from developing. A VBs may be used on most inlet-type water connections that are not subject to back pressure. Some examples are:

- Chemical fill stations
- Single zone lawn sprinkler systems
- Commercial dishwashers
- Fluoride saturators

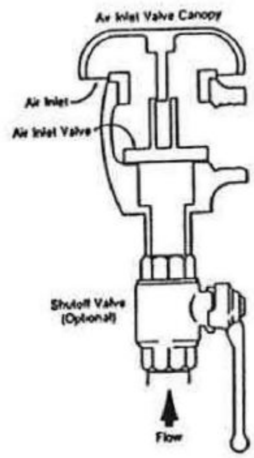


FIGURE 6. AtmosphericVacuum Breaker

A VBs must be installed at least 12 inches above all downstream points of use. They must be installed upstream of any shut off valves. AVBs are not designed for continuous use (more than 12 hours at a time) because this can cause them to stick in the open position. They protect against back-siphonage but not back pressure and are used for low and high hazard cross connections. Atmospheric vacuum breakers must be ASSE approved and should be used for isolation only, not containment. A VBs do not require annual testing by a certified tester. ***(See page 9 or more information on isolation and containment.)***

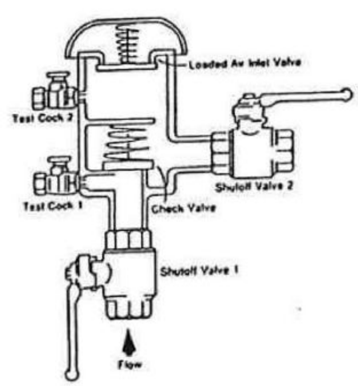


FIGURE 7: Pressure Vacuum Breaker

Pressure Vacuum Breaker

A pressure vacuum breaker (PVB) is similar to an AVB, but it includes a spring to help open the air inlet valve when flow stops and a spring loaded check valve (Figure 7). Like A VBs, PVBs may be used in low and high hazard applications and protect against back siphonage only. Since neither device protects against back pressure, each must be installed 12 inches above the highest usage point. PVBs will work under continuous pressure and can have downstream valves. PVBs can be tested to insure they are working properly. Pressure vacuum breakers are typically used for multi-zone lawn sprinkler systems. PVBs require annual testing by a certified tester.

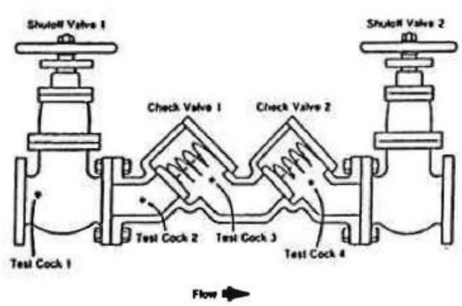


FIGURE 8: Double Check Valve Assembly

Double Check Valve Assembly

A double-check valve assembly (DCV A) is two spring loaded check valves housed in one unit with test cocks and shut-off valves (Figure 8). The check valves operate independently of each other, so if one fails, the other still provides protection against backflow. The check valves are loaded to hold tight against at least 1 psi in the direction of flow. Double check valves can be used to protect against back pressure and back siphonage, but can only be used in low hazard applications. Double check valves cannot be installed below ground level. The head-loss through a double check valve is less than 10 psi. Homemade double check valves are not acceptable because they cannot be tested. State law now exempts DCV As from annual testing by a certified tester.

Reduced Pressure Principle Backflow Prevention Assembly

A reduced pressure zone backflow prevention assembly (RP) consists of two spring loaded, pressure-reducing check valves with a pressure regulated relief valve between them. During normal operation, flow from the supply side passes through the first check valve, lowering the pressure in the zone between the two check valves, and then through the second check valve to the user. The relief valve is held closed by supply side pressure acting on a diaphragm in the relief valve. Supply side pressure is transmitted to the relief valve through a sensing tube. When water is not flowing, both check valves are held shut by their springs and supply side pressure holds the relief valve closed. If the supply pressure drops, the relief valve will open to allow water out until the pressure in the zone is at least 2 psi lower than supply pressure. If the supply pressure falls below 2 psi, the relief valve will open and discharge water from the reduced pressure zone, preventing back siphonage. If the assembly is subjected to back pressure, both check valves should remain closed and prevent backflow. Even if the second check valve is leaking and the assembly is subjected to back pressure, the relief valve will open when the downstream pressure is within 2 psi of supply pressure, discharging any water that leaked through the second check valve, preventing backflow. A continuous stream of water from the relief valve indicates malfunction of one or both check valves or the relief valve. A little water comes through the relief valve during normal operation.

For an RP to work properly. it must be able to discharge water from the relief valve to the atmosphere. This is why RPs cannot be installed in a pit. where the relief valve can become submerged.

Normal pressure loss through this device is between 10 and 20 psi, depending on the size of the device and flow. RPs protect against back pressure and backsiphonage, and can be used in high hazard applications. Rps require annual testing by a certified tester. If a bypass line is installed around an RP to allow the unit to be taken out of service without shutting off water to the connection, the bypass line must also contain an RP.

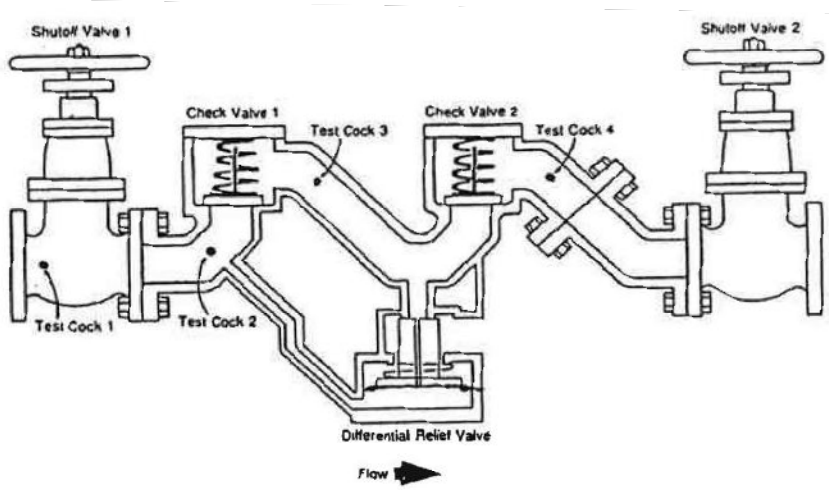


FIGURE 9. Reduced Pressure Principle Backflow Preventer