Cross Connections-Backflow Prevention

DPHHS Webinar

by
Karl Carlson MTDEQ
2022

Objectives:

-Define Cross Connections, Direct and Indirect, Isolation vs. Containment

-Classify the Degree of Hazard and Public Health Significance

-Explore Backflow, Backpressure and Backsiphonage

- Learn Method, Assembly, and Device Differences

-Learn the common Approved Backflow Preventer types and their applications

What is a cross connection?

-A cross connection is a connection between a potable water system and any other liquid.

Or….

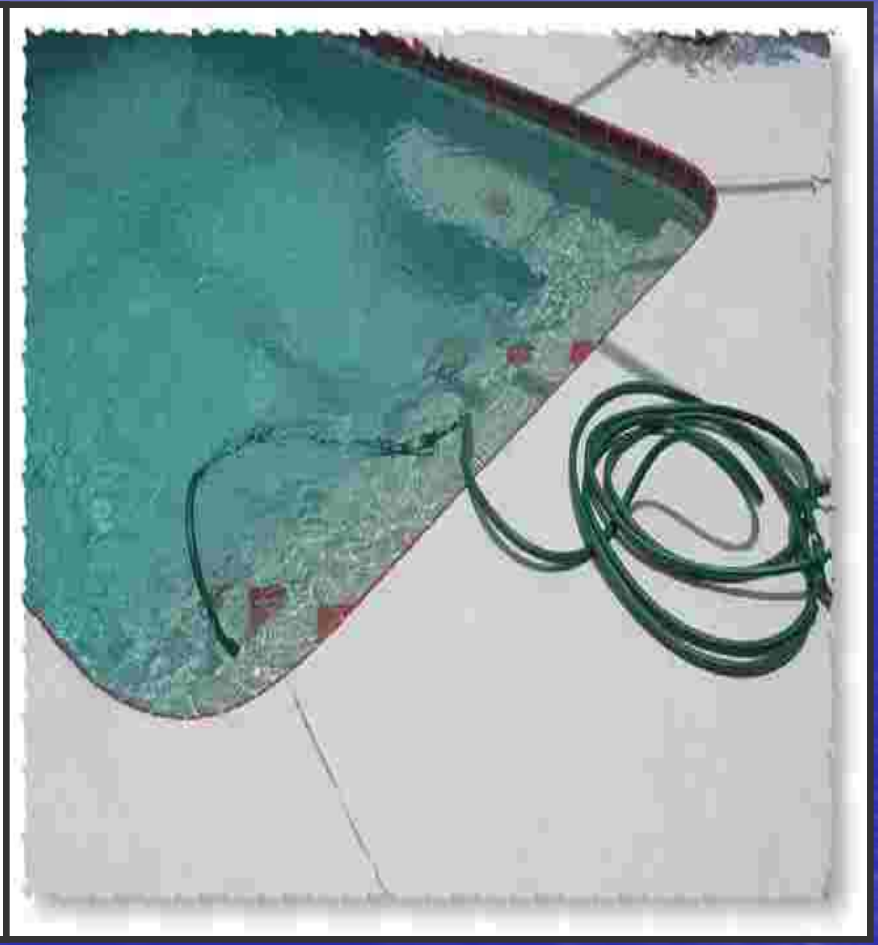
-MCA 75-6-102 "Cross-connection" means a connection between a public water supply system and another water supply system, either public or private, or a wastewater or sewer line or other potential source of contamination…

Common Cross Connections

- *Fire sprinkler systems*
- *Irrigation sprinkler systems*
- *Hospitals and Medical Clinics*
- *Industrial facilities*
- ***Swimming pools, Spas, and Hot tubs***
- *Water heating systems*
- *Photo processing equipment*
- *Insecticide sprayers*
- *Fertilizer injection equipment*
- ***Food service facilities***

Types of Cross Connections

Direct



Indirect

- Direct Connection
  - Directly connected to the water supply, i.e. espresso machine.
  - Subject to backpressure and backsiphonage

- Indirect Connection
  - Submerged inlets into a contaminated source, i.e. steam table.
  - Subject to backsiphonage

The Degree of Hazard

- *Determines type of control needed for protection of public health*
- *Low Non-Health Hazard-Pollution Hazard-Non-Toxic*
- *High Health Hazard-Contamination Hazard-Toxic*

Cross connections 3 Questions:

- *What type of Cross-Connection is it?*
  - *Indirect?*
  - *Direct?*
- *What is the degree of Hazard?*
  - *Non-health hazard?*
  - *Health hazard?*
- *Is it under continuous use (or pressure)?*

Application Guide

BACKFLOW PREVENTION ASSEMBLY GENERAL APPLICATIONS *

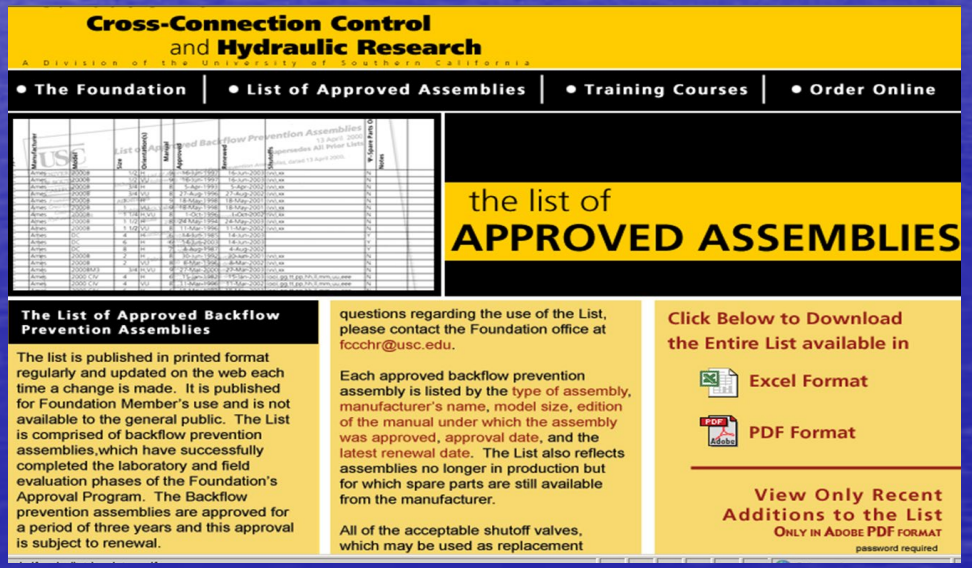
	Non-Health Hazard (POLLUTANT)		Health Hazard (CONTAMINANT)		Sewage	
	BACKSIPHONAGE	BACKPRESSURE	BACKSIPHONAGE	BACKPRESSURE	BACKSIPHONAGE	BACKPRESSURE
AIR GAP	X	X	X	X	X	X
RP	X	X	X	X		
DC	X	X				
PVB	X		X			
SVB	X		X			
AVB	X		X			

* *NOTE: These are general guidelines. Check with local administrative authority(s) for local applications.*

TABLE 4-1
BACKFLOW PREVENTION ASSEMBLY GENERAL APPLICATIONS


anual
of Cross-Connection
Control
USC

FCCCHR


Cross-Connection Control
and Hydraulic Research
A Division of the University of Southern California
• The Foundation
• List of Approved Assemblies
• Training Courses
• Order Online
the list of
APPROVED ASSEMBLIES
The List of Approved Backflow Prevention Assemblies
The list is published in printed format regularly and updated on the web each time a change is made. It is published for Foundation Member's use and is not available to the general public. The List is comprised of backflow prevention assemblies,which have successfully completed the laboratory and field evaluation phases of the Foundation's Approval Program. The Backflow prevention assemblies are approved for a period of three years and this approval is subject to renewal.
questions regarding the use of the List, please contact the Foundation office at fccchr@usc.edu.
Each approved backflow prevention assembly is listed by the type of assembly, manufacturer's name, model size, edition of the manual under which the assembly was approved, approval date, and the latest renewal date. The List also reflects assemblies no longer in production but for which spare parts are still available from the manufacturer.
All of the acceptable shutoff valves, which may be used as replacement
Click Below to Download the Entire List available in
Excel Format
PDF Format
View Only Recent Additions to the List
Only in Adobe PDF format
password required

Regulations about Cross Connections

- Montana Code Annotated: 75-6-102 and 103
- Administrative Rules, ARM 17.38 Subchapter 3
- Uniform Plumbing Code as amended by ARM 24.301.301

ARM 17.38 Subchapter 3

- **17.38.305(1)** – a *cross-connection on a PWSS must be eliminated or protected with an approved backflow prevention assembly.*

- **17.38.305(2)** – *the type of approved valve is determined by the hazard type and backflow type.*

Health Hazard

- The degree of hazard determines which type of device to install.
  - High or Health-hazard = Contamination (toxic)
    - Anything that may cause illness or death
      - Most food service connections are considered high-hazard, due to possible foodborne microorganism contamination or the use of chemicals used to clean equipment.

Most common biological contaminates

- According to incidents and records

  - Shigella
  - E. coli
  - Salmonella
  - Campylobacter jejuni
  - Cyanobacteria
  - Norwalk-Norwalk like viruses
  - Giardia
  - Other

Most common chemical contaminates

- In order of decreasing occurrence:

- Copper (plumbing)
- Chromium (rust inhibitor)
- Ethylene glycol (antifreeze)
- Detergents (industrial use)
- Chlordane (pesticide)
- Malathion (pesticide)
- Propylene Glycol (antifreeze and food additive)
- Freon (cooling systems)
- Nitrite (fertilizer)

Non-Health Hazard

- Low or Non-Health Hazard = Pollution (non-toxic)
  - Anything that is aesthetically objectionable either due to color, odor or taste.
    - Irons or salts are not a health hazard but can be aesthetically unpleasing, i.e. water softener.
      - This may also include connection to non-carbonated beverage machines (changes the water quality), i.e. coffee machines, tea machines and juice machines.

Public Health Significance

- "over 100,000 new cross-connections are formed each day" (AWWARF, 2000)

- "the greatest contributing factor to waterborne disease outbreaks in the U.S." (AWWARF, 2000)

Public Health Significance

- *Many documented cases of disease outbreaks and accidental poisoning*
- *Infrequent monitoring does not catch the event*
- *Backflow event may be of short duration*
- *Number of affected people may be low and go unnoticed*

HOW DO CROSS CONNECTIONS CONTAMINATE?

-BACKFLOW

Define Backflow:

- The undesirable reversal of flow of water or other substances into the potable water distribution supply

Types of Backflow

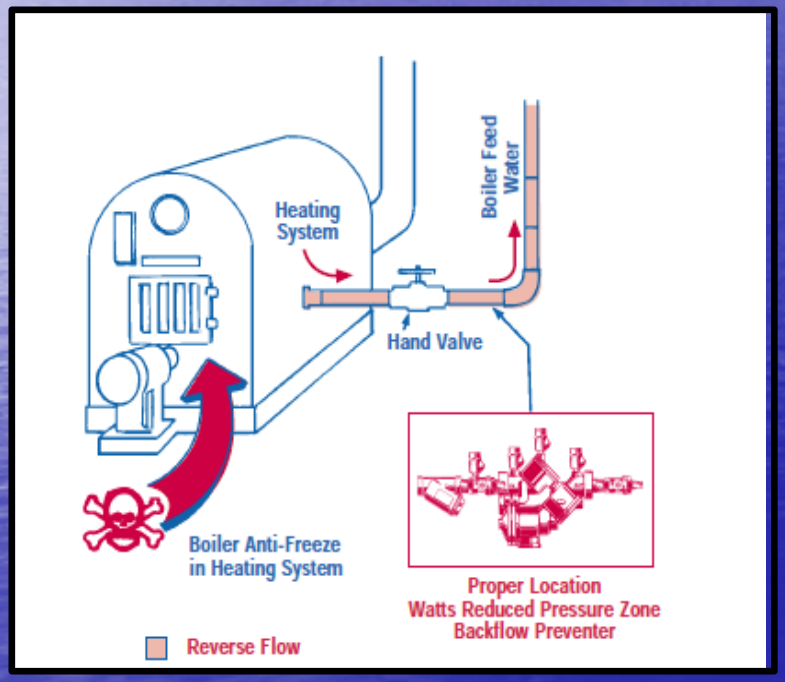
- *Backflow occurs when conditions in the system cause*

  *-**Backpressure**- pressure applied that is greater than supply pressure reversing flow*

  or

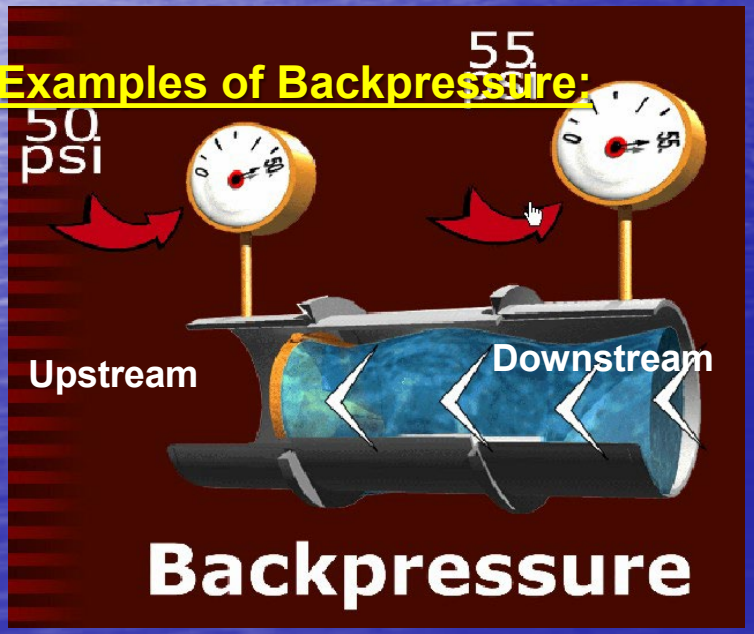
  *-**Backsiphonage** -negative pressure creates vacuum reversing flow*

Backpressure example



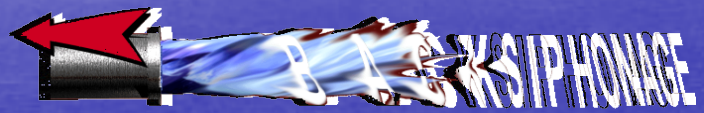
Hydraulics

- Backpressure
  - Pressure in downstream piping greater than supply pressure.



- High pressure generated by pumps downstream
- Thermal expansion
- Elevation

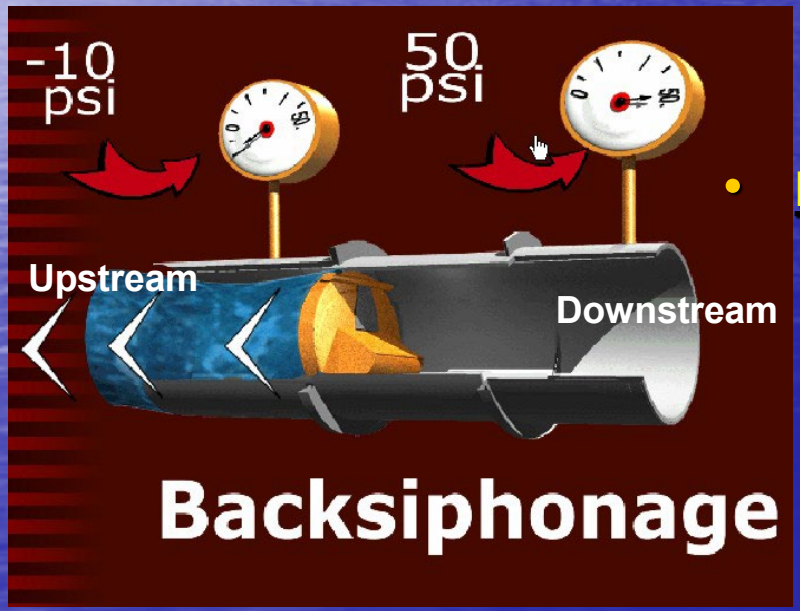
Backsiphonage example



Normal Direction of Flow

Hydraulics

- Backsiphonage
  - Pressure upstream drops to create a vacuum.

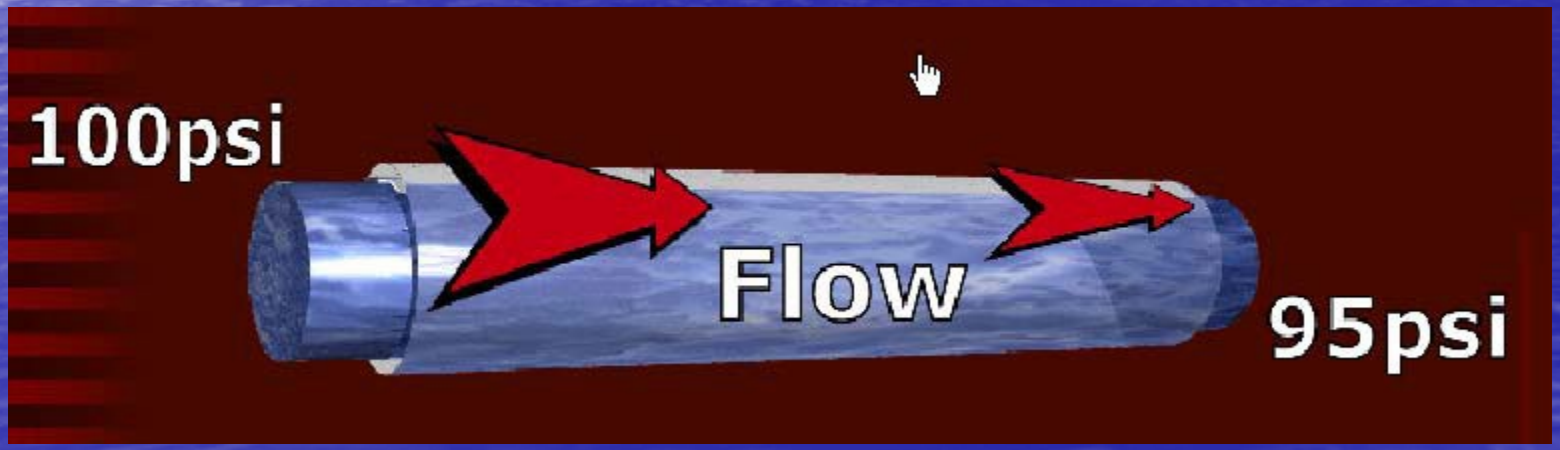


Examples of Backsiphonage:

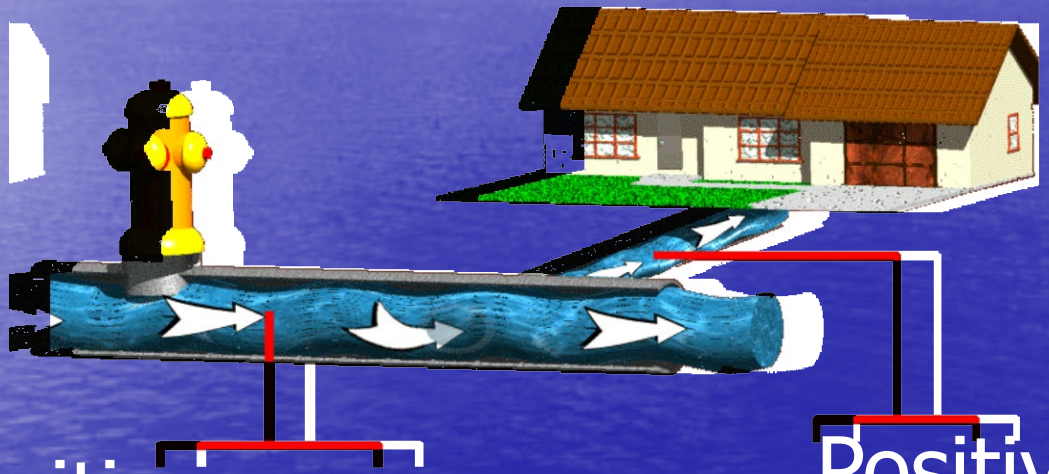
- Pipeline breaks
- High withdrawal rates can create a vacuum (fire hydrant upstream or toilets flushing simultaneously upstream).

Hydraulics

- Water pressure naturally tends to equalize.
  - Water flows from high pressure regions to low pressure regions.



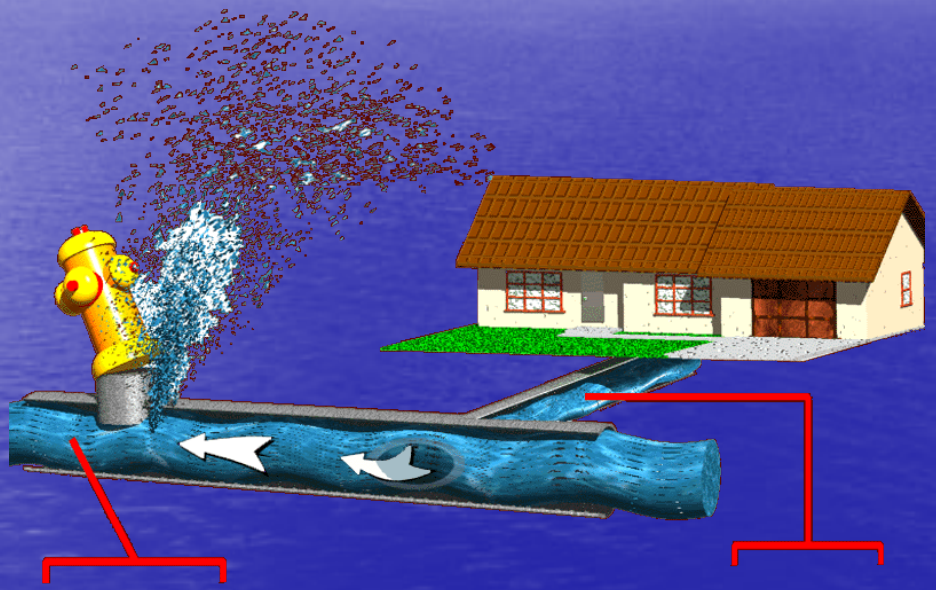
Normal conditions…



Positive pressure

Positive pressure

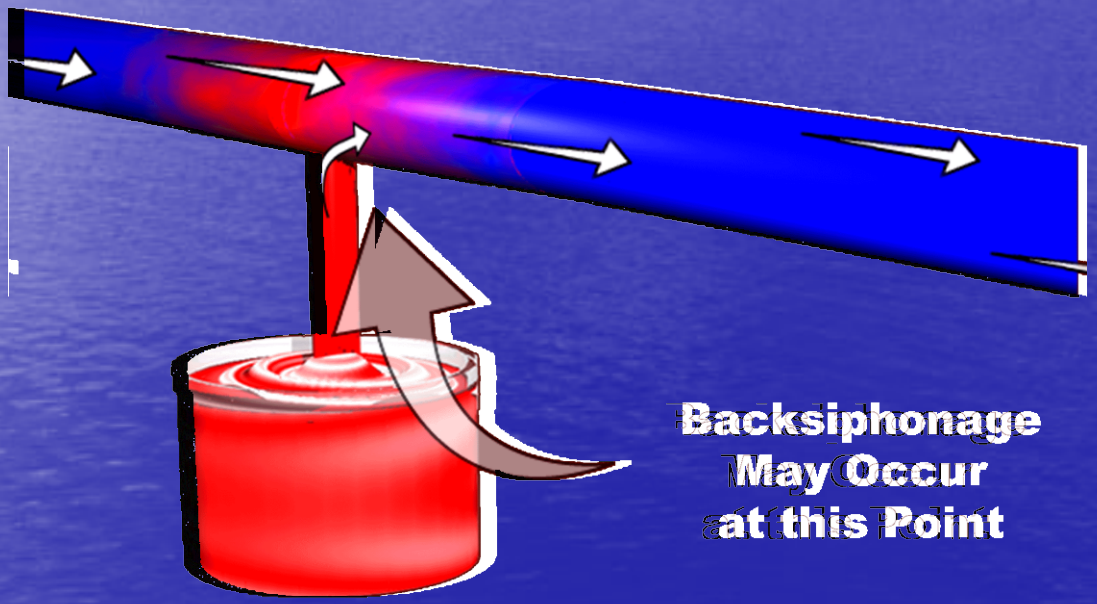
Abnormal conditions…

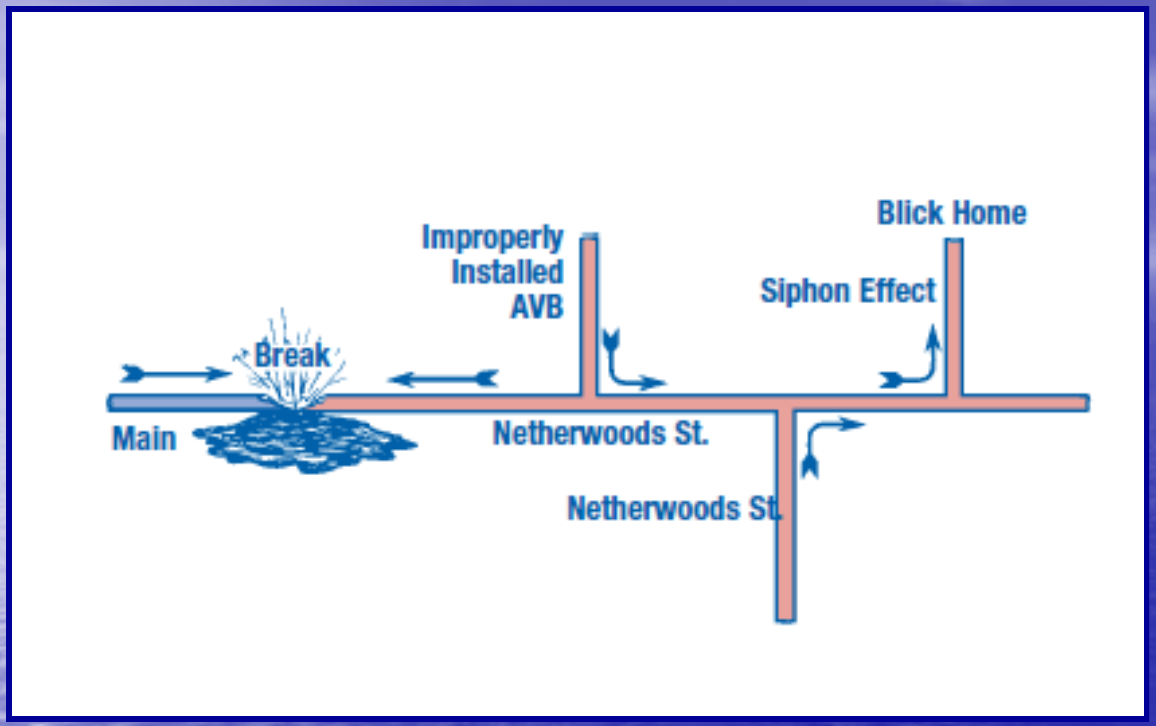


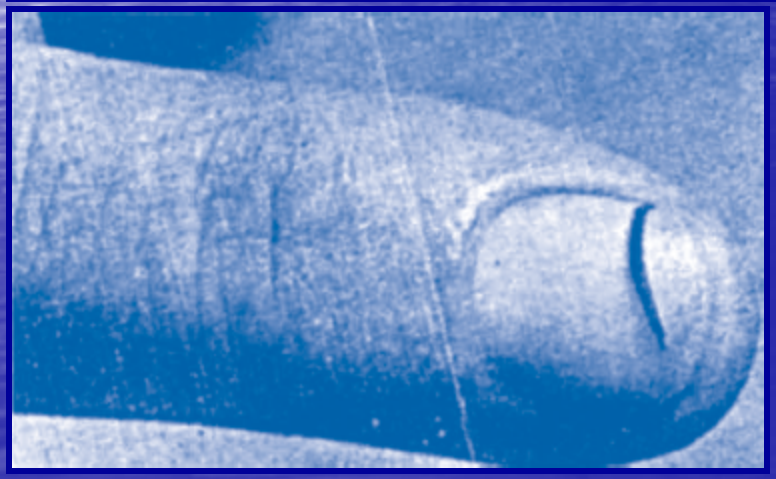
Lo pressure

Reversal of flow

Aspirator effect:







Year: ***1991***

Contaminate: ***nematodes***

Source: ***sprinkler system***

Cause: ***water main break-backsiphonage***

Effect: ***kids got to bath with worms***

Approved Backflow Control

- **Method**

-a plumbing configuration or way to eliminate the cross connection hazard

- **Assembly**

-mechanical equipment able to be tested (isolation valves and test ports provided)

- **Device**

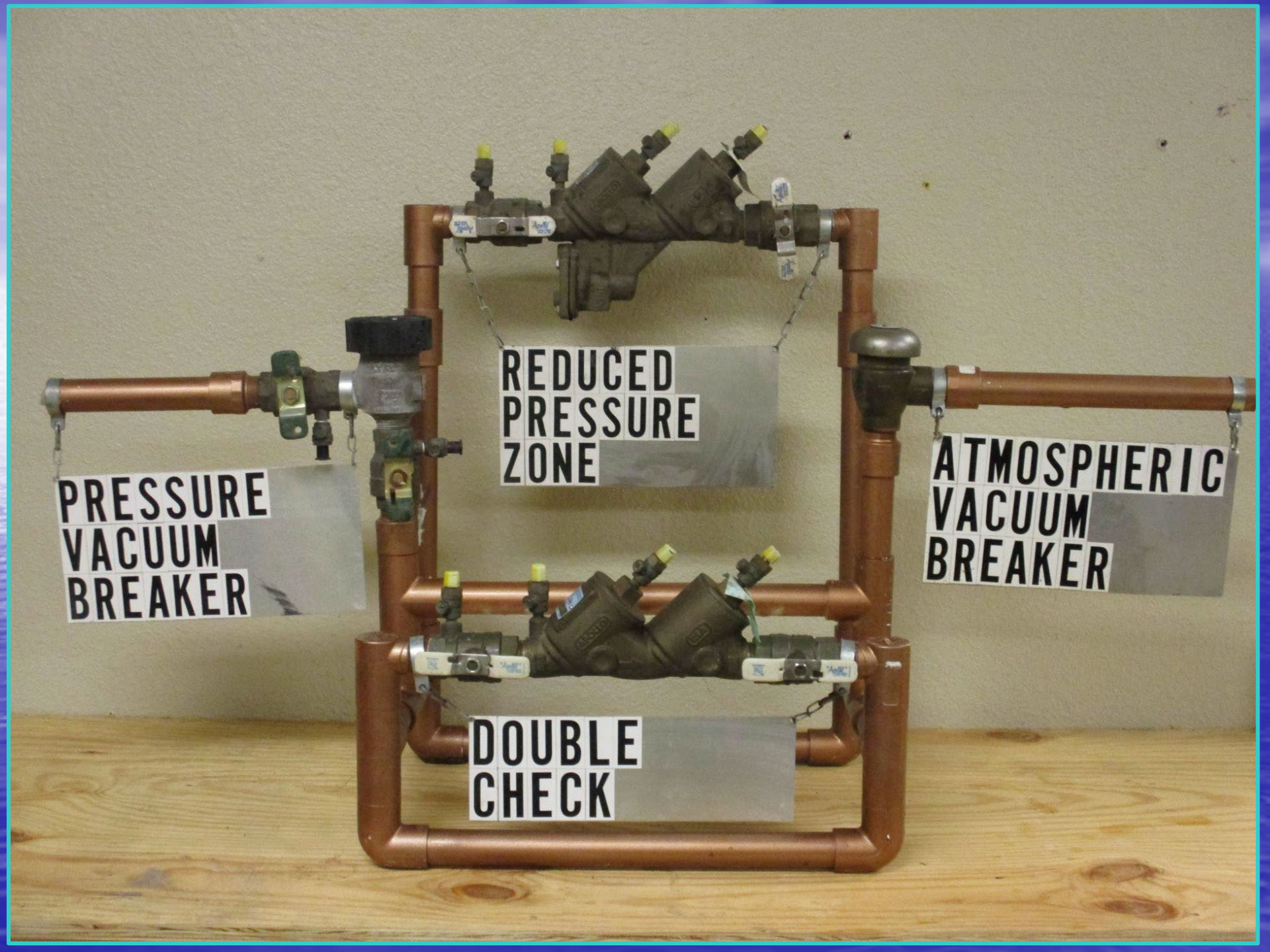
-self contained non-testable (no isolation valves or test ports)

Containment vs. Isolation

- Containment – Protecting the source or main from the building or facility supply.
  - i.e. A backflow preventor at the water meter
- Isolation – Protection at each individual point of use.
  - The Food Code and Plumbing Code may require protection at each point of use to protect the water supply throughout the facility.

The Five Basic Products

1. **Air Gap** (Method)
2. **Atmospheric Vacuum Breaker** (Devices)
3. **Pressure Vacuum Breaker** (Assembly)
4. **Double Check Valve** (Assembly)
5. **Reduced Pressure Zone** (Assembly)


REDUCED
PRESSURE
ZONE
PRESSURE
VACUUM
BREAKER
ATMOSPHERIC
VACUUM
BREAKER
DOUBLE
CHECK

1. Air Gap Method

Air Gap Method-

-Ultimate backflow preventer

-Use for low and high hazards

Limitations: *gaps must be correct*

Disadvantages: *easy to circumvent*

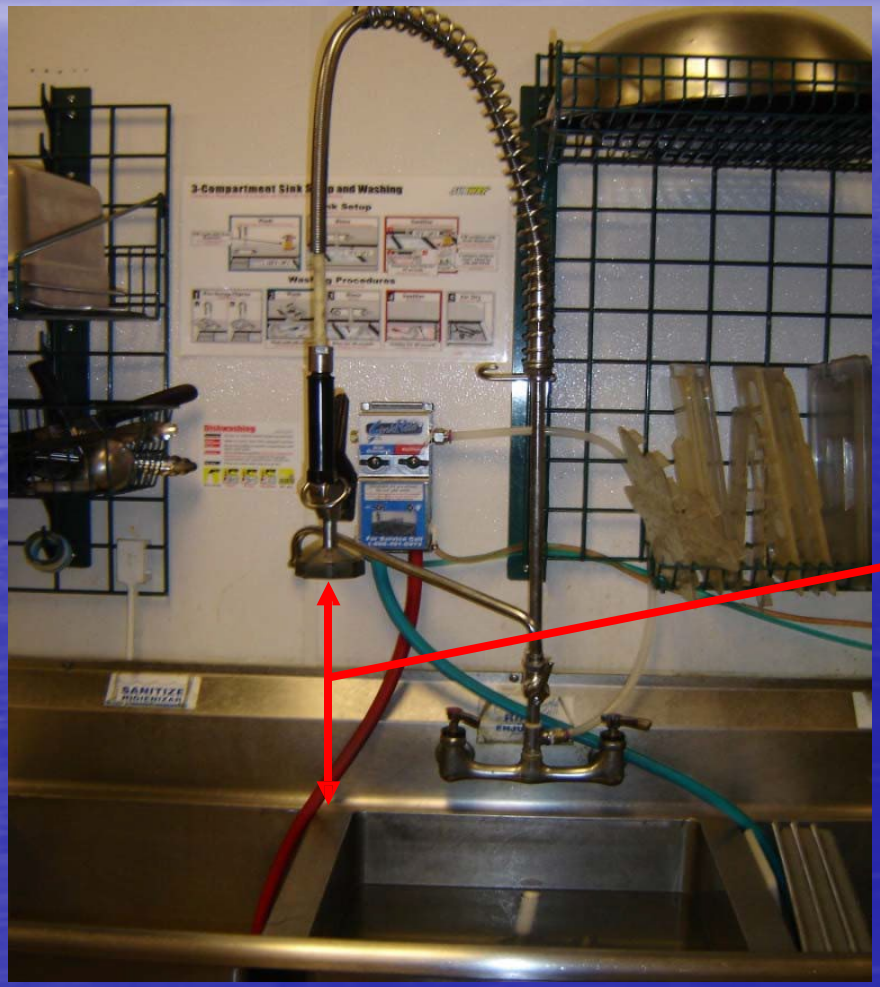
Sink

Dipper Well


Minimum
of 1 inch
air gap


Drain line
must be
air gapped
from the
floor drain

Spray Arm at Dish Area



Spray arm must be a minimum of 1” above the flood rim of the sink.

Water Treatment Systems

This system is a reverse osmosis system and the two lines indicated are discharge lines. All drain lines must be air gapped.

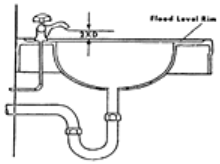
This is a water softener discharge line. Air gap from floor drain.

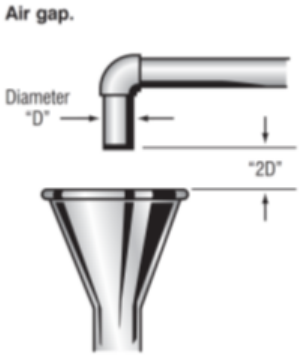
Air Gap - Waste Lines

Air Gap - Waste Lines

- Typical equipment requiring air gapped waste lines:
  - Walk-in cooler
  - Food prep sink
  - Dipper well
  - Ice machines/bin
  - Steam table/Baine Marie
  - Wok
  - Dish washer (Air Break)
  - Combi-Oven
  - Rethermalizer
  - Steamer
  - Water softener
  - Water cooled equipment
  - Kettle
  - Reach-in cooler (Non-evaporating)
  - Pop gun holster

Air Gap





Examples for illustrative purposes only.
Styles differ by model, manufacturer, and application.

Mechanical Description:
A method of physical separation between the free-flowing discharge end of a potable water supply pipeline and an open or non-pressure receiving vessel. An "approved air gap" shall be at least twice the diameter of the supply pipe measured vertically above the overflow rim of the receiving vessel; in no case less than 1 inch (2.54 cm).

Applications:
Sinks, toilets, tanks, pools, fire systems, industrial and agricultural systems, food industry, and bulk loading stations.

Limitations:
In a continuous piping system, each air gap requires the added expense of reservoirs and secondary pumping systems. The air gap may be easily defeated in the event that the "2D" requirement was purposely or inadvertently compromised. Excessive splash may be encountered in the event that higher than anticipated pressures or flows occur.

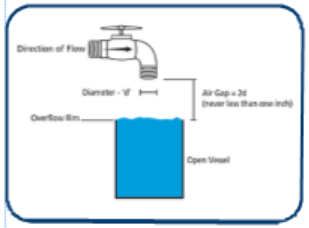
Installation Guidelines:
Must be at least twice the diameter of the supply pipe never less than one-inch the simple solution to reduce splashing being to reduce the "2D"dimension by thrusting the supply pipe into the receiving funnel is not accepted. By so doing, the air gap is defeated. Manufactured air gaps are normally accepted as meeting all requirements reviewed on a case by case basis.

Protection:
Extremely effective backflow prevention method when used to prevent backsiphonage and backpressure conditions. Does protect against non-health hazards (i.e., pollutants) or health hazards (i.e., contaminants).

Hazard Rating:
Health hazards and non-health hazards.

Pressure Condition:
Flow of water is interrupted and loss of pressure occurs. Because of this, air gaps are used at the end of a pipe.

Hydraulics, Orientation and Rule Requirements



Loading station air gap

Requirements for Public Water Supplies:
As mandated by the federal Safe Drinking Water Act, water suppliers are responsible for ensuring that the water they supply meets federal primary drinking water regulations and is delivered to consumers without compromising water quality due to its distribution system. Water utilities may want to implement a cross connection program to stave off any problems that could occur.

Mechanical backflow preventers have internal seals, springs, and moving parts that are subject to fouling, wear, or fatigue. Also, mechanical backflow preventers and air gaps can be bypassed. Therefore, all backflow preventers have to be tested periodically to ensure that they are functioning properly. A visual check of air gaps is sufficient, but mechanical backflow preventers have to be tested with properly calibrated gauge equipment by a certified individual.

Administrative Rules of Montana:
17.38.305 CROSS-CONNECTIONS: REGULATORY REQUIREMENTS
(1) A cross-connection on a public water supply system must be eliminated by the disconnection of the cross-connection whenever reasonably practicable. Whenever elimination of a cross-connection is not reasonably practicable and the cross-connection creates a health or non-health hazard, the hazard must be eliminated by the insertion into the piping of an approved backflow prevention assembly or device.

Additional Resources:
Administrative Rules of Montana: Cross-Connections in Drinking Water 17.38.301—312 http://www.mtrules.org
American Backflow Prevention Association https://abpa.site-ym.com/
Environmental Protection Agency Cross Connection Control Manual (2003) http://nepis.epa.gov
Foundation for Cross-Connection Control and Hydraulic Research https://fccchr.usc.edu/introduction.html

Montana Department of Environmental Quality
Public Water Supply Bureau
Telephone: (406) 444-4400
Website: http://deq.mt.gov/water/drinkingwater
DEQ Contacts: https://directory.mt.gov/govt/state-dir/agency/deq

Definitions and incorporated standards are referenced in the Definitions and Incorporation by Reference section of ARM 17.38.301 and 17.38.302.
Cross connections on public water supplies are referenced in the Cross Connection: Regulatory Requirements section of ARM 17.38.305.
Cross-Connection Control Programs are referenced in the Voluntary Cross-Connection Control Programs section of ARM 17.38.310.

How does the new Lead Free Law affect Backflow Prevention?

The Reduction of Lead in Drinking Water Act (42 USC 300G) requires that for manufacture, supply, new installs, and replacement, any valve, fitting, or fixture coming in contact with potable water must meet the requirement of having weighted average lead content of less than 0.25 percent.

Do I need to go out and find and replace all system components built before 2014 that allowed for up to 8% lead?" The answer is no, but when components fail and/or need replacement they need to be replaced with products meeting the new lead-free definition of 0.25%.

Handouts

Air Gap

Atmospheric Vacuum Breaker

Double Check Valve

Hose Bibb Vacuum Breaker

Pressure Vacuum Breaker

Reduced Pressure Assembly

Who can I contact for more information?

Karl Carlson, Montana DEQ Field Inspector and Water Quality Specialist
Phone:(406) 247-4444 E-mail: kcarlson2@mt.gov
Billings, Montana

Questions….

2. Atmospheric Vacuum Breaker Devices

Atmospheric Vacuum Breaker Devices- AVB

-Great for small applications

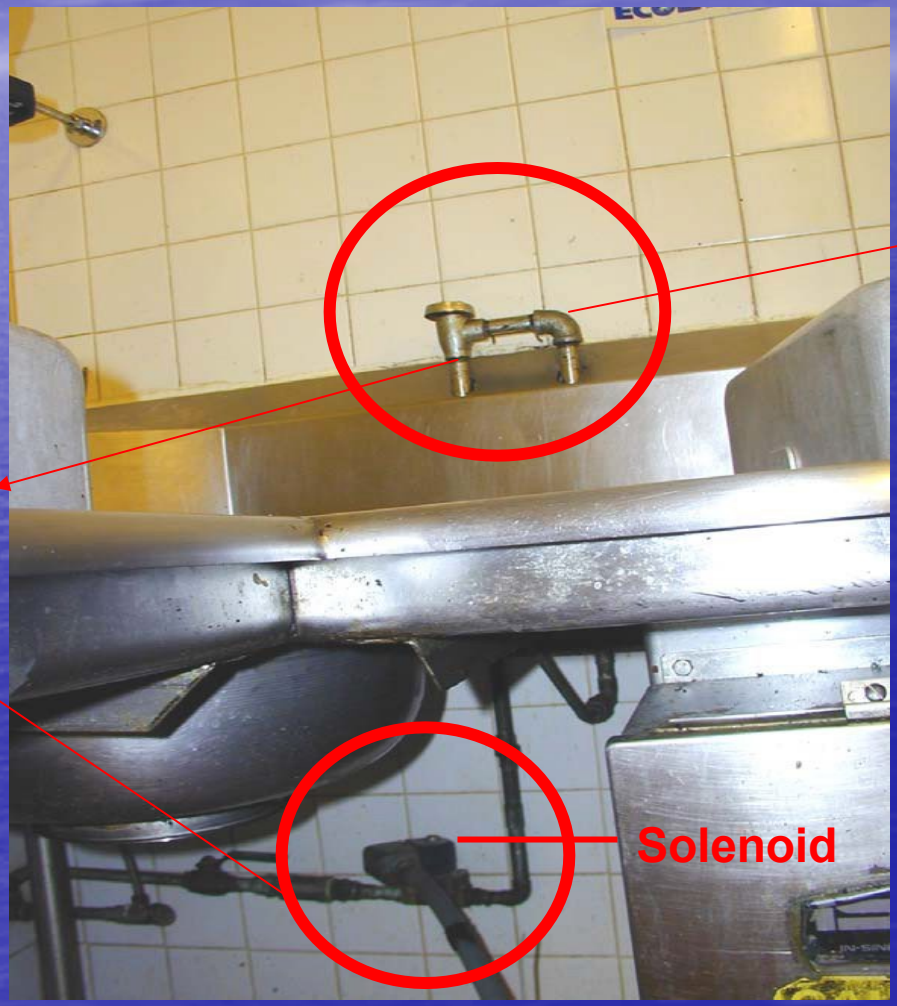
-Use for low and high hazards

Limitations: *cannot be under continuous pressure and*

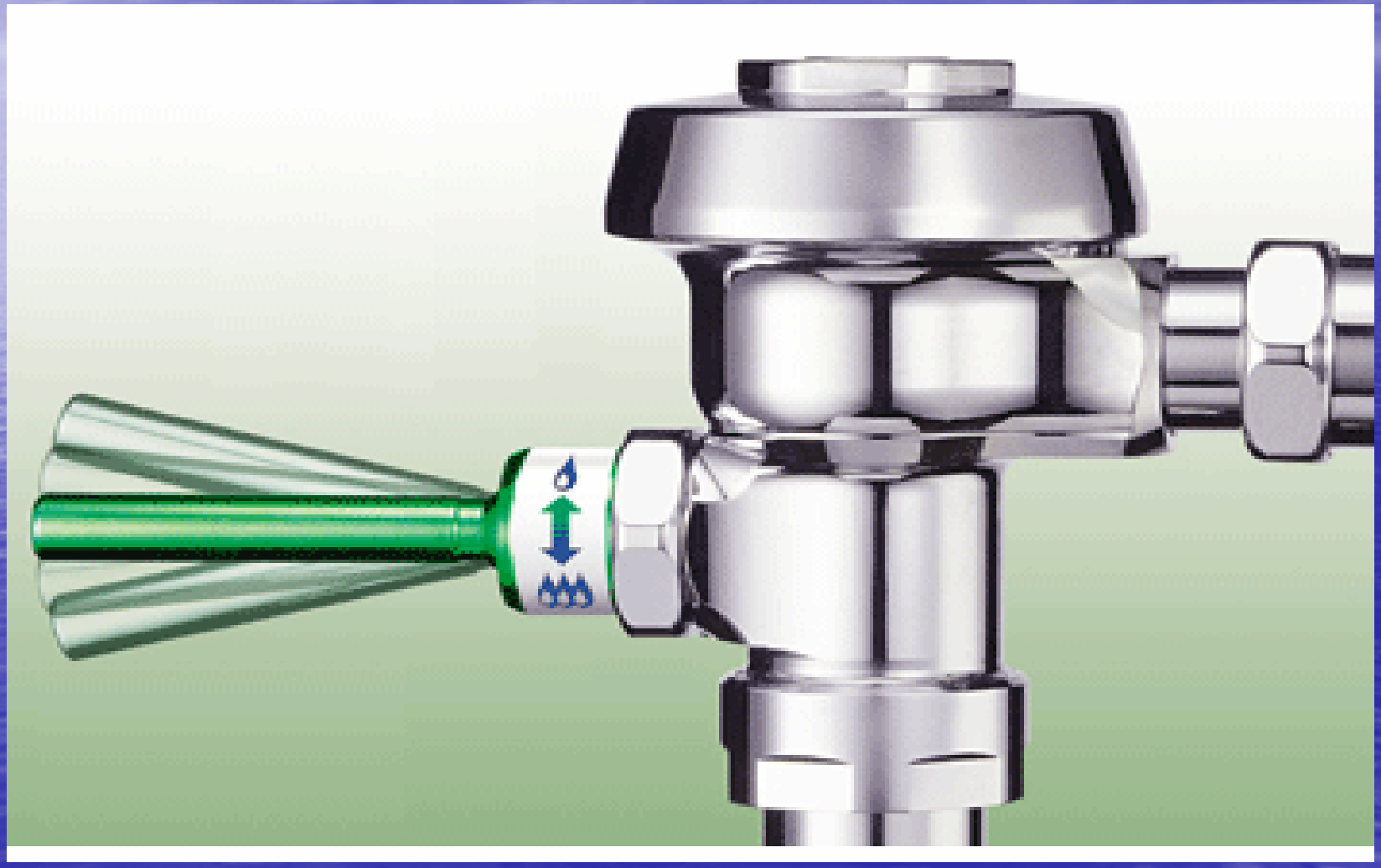
no downstream valves

Disadvantages: *cannot protect against backpressure*

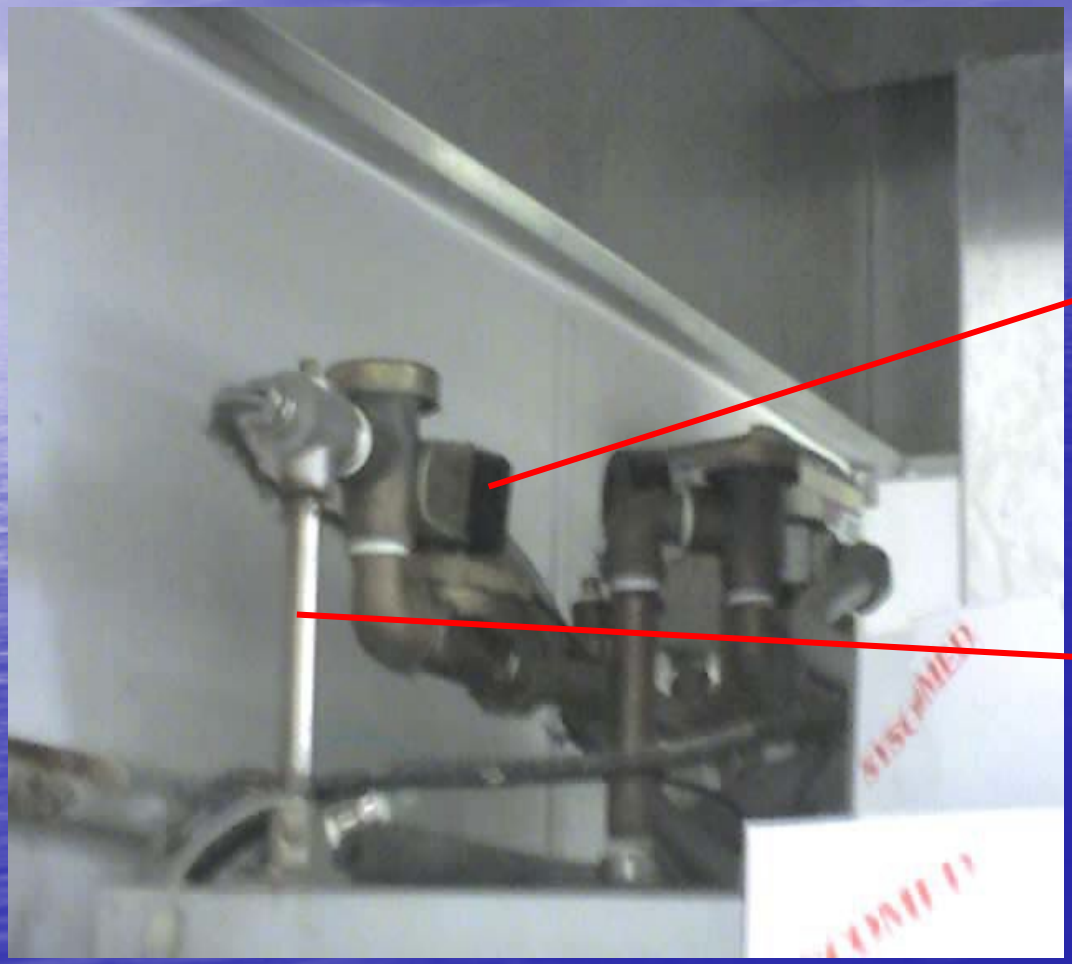
Garbage Disposal



AVB at Pressure/Toilet Urinal



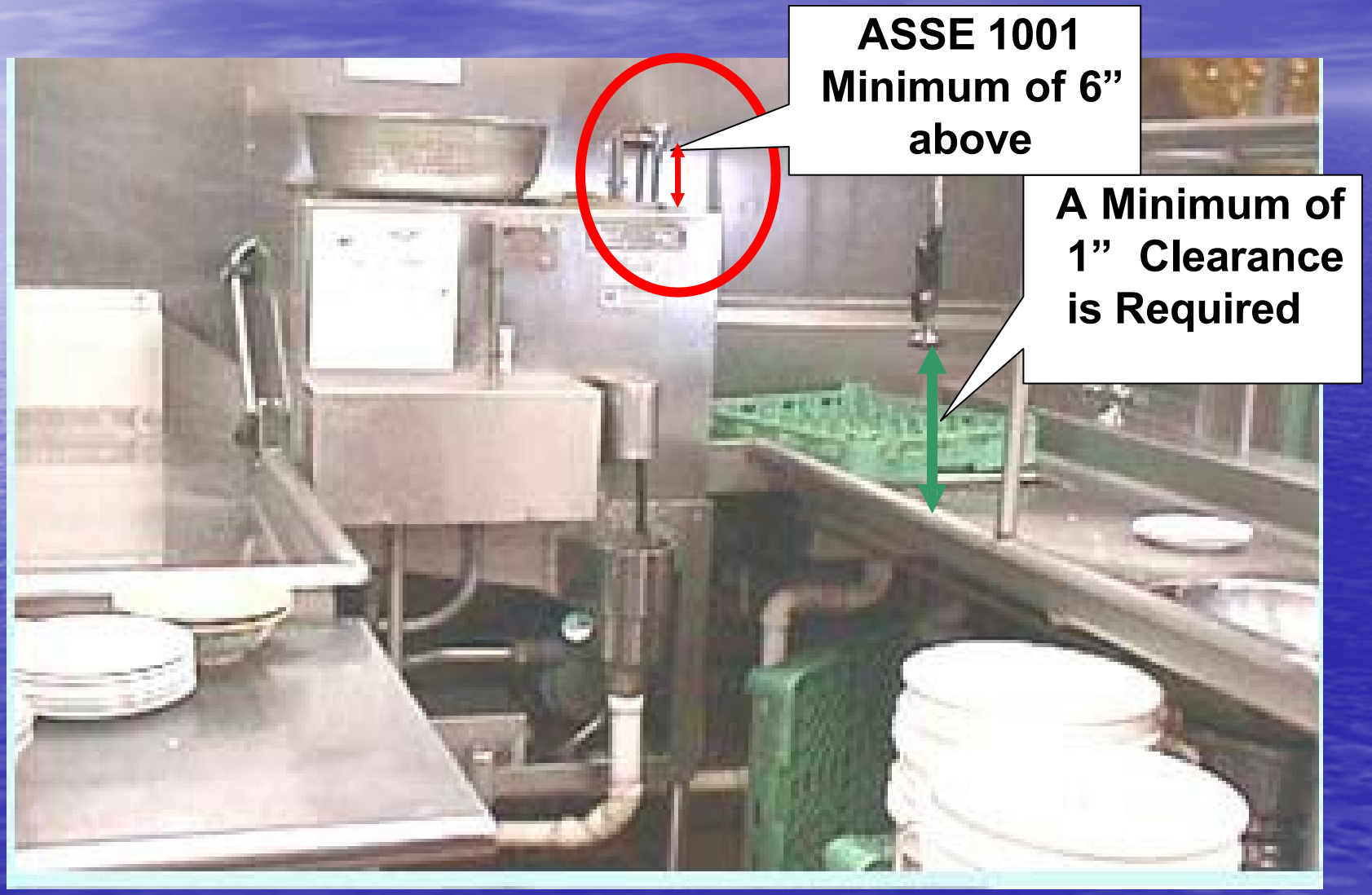
Dish Machine



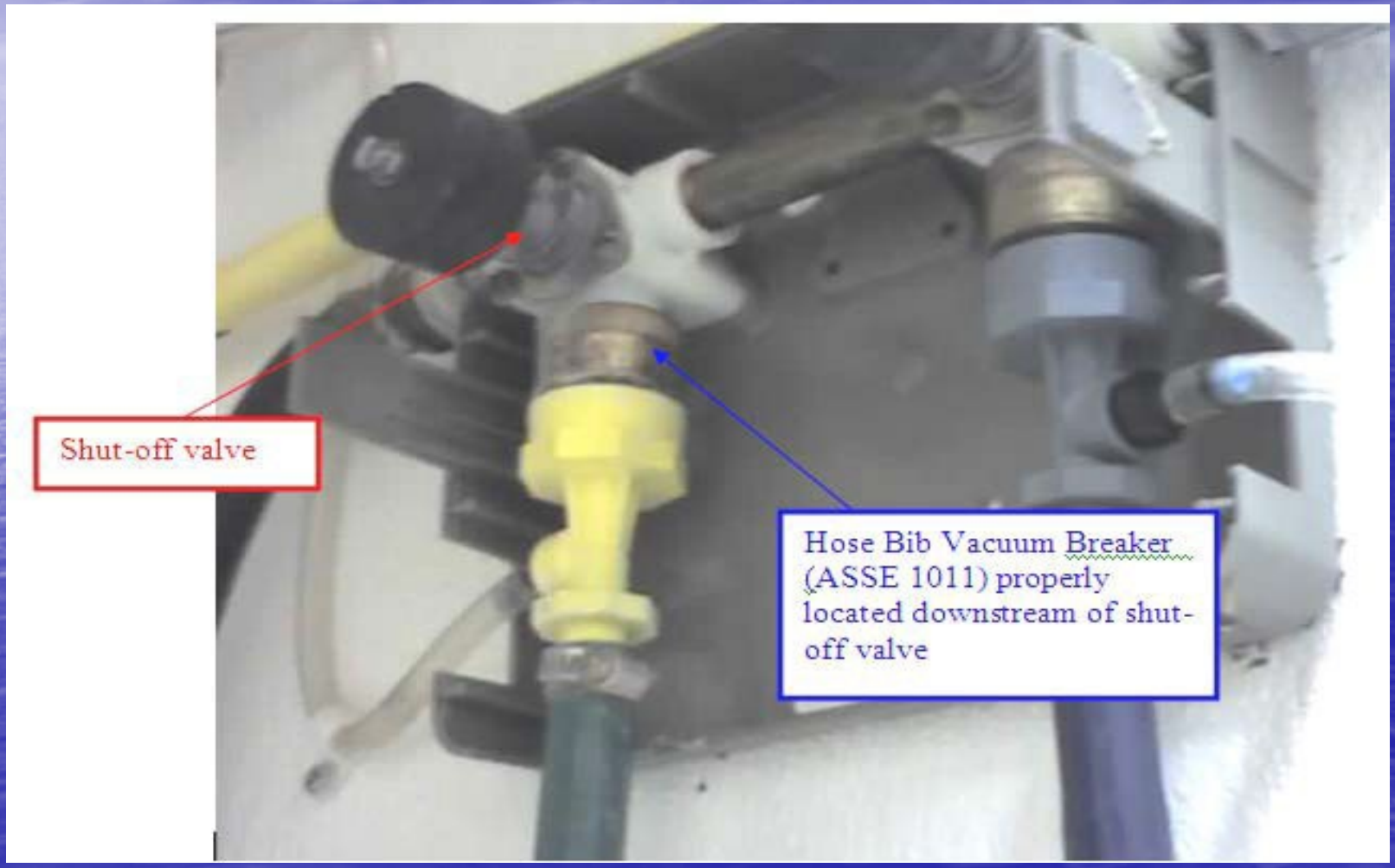
Solenoid to control water flow

Water into dish machine

Dish Machine



Chemical Towers - Atmospheric Vacuum breakers -



Chemical Towers – Atmospheric Vacuum breakers

The chemical systems with the built-in atmospheric vacuum breaker have the shut-off upstream. Other systems should be checked for proper installation.

Chemical Dispensers

- Many chemical dispensers have an air gap in the unit meeting ASSE 1055b standards.
  - These units have backflow protection and may be connected directly to the water supply.

Line to the chemical dispenser directly from where the faucet connection is located.

- 1055B

Hose Bib Vacuum Breaker: AVB – (ASSE 1011)

- This device may attach to any threaded faucet.
- **NO** Shut off valves may be located downstream.
- **Cannot be subject to more than 12 hours of continuous pressure.**


AIR
WATER
R.V.
DISPOSAL
FREE TO
CUSTOMERS
NO PARKING
Hose Connection
Vacuum Breaker

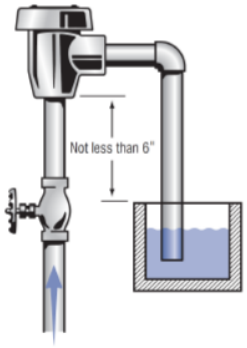

melnor
WATER DAY
START WATER
HOW LONG
SET CLOCK
NEXT START TIME
AM
707
TH
OFF
AUTO
ZONE
1 2 3 4
OK
FLEXZILLA

DEQ
Montana Department of Environmental Quality

AVB: Atmospheric Vacuum Breaker

Example for illustrative purposes only.
Valves differ by model and manufacturer.

Atmospheric vacuum breaker typical installation.



Mechanical Description:
A device containing an air inlet valve, a check seat and an air inlet port(s). The flow of water into the body causes the air inlet valve to close the air inlet port(s). When the flow of water stops the air inlet valve falls and forms a check valve against backsiphonage. At the same time it opens the air inlet port(s) allowing air to enter and satisfy the vacuum. A shutoff valve immediately upstream may be an integral part of the device, but there shall be no shutoff valves or obstructions downstream.

Applications:
Toilets, sink faucets, urinals, ball cocks, limited irrigation, and isolation protection.

Limitations:
An atmospheric vacuum breaker does not protect against backpressure.

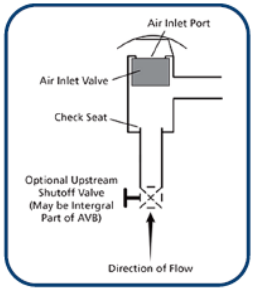
Installation Guidelines:
An atmospheric vacuum breaker must be installed at least six inches above all downstream piping and outlets. The critical level (C/L) of the valve shall be the bottom of the valve body unless otherwise indicated.

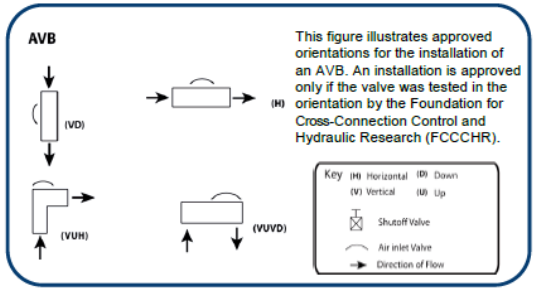
Protection:
An atmospheric vacuum breaker is designed to protect against a non-health hazard (i.e., pollutant) or a health hazard (i.e., contaminant) under a backsiphonage condition only.

Hazard Rating:
Health hazards and non-health hazards.

Pressure Condition:
Device may not be subjected to continuous pressure, may only be used for twelve hours out of any twenty-four-hour period and may have no shutoff valves downstream.

Hydraulics, Orientation and Rule Requirements





Requirements for Public Water Supplies:

As mandated by the federal Safe Drinking Water Act, water suppliers are responsible for ensuring that the water they supply meets federal primary drinking water regulations and is delivered to consumers without compromising water quality due to its distribution system. Water utilities may want to implement a cross connection program to stave off any problems that could occur.

Mechanical backflow preventers have internal seals, springs, and moving parts that are subject to fouling, wear, or fatigue. Also, mechanical backflow preventers and air gaps can be bypassed. Therefore, all backflow preventers have to be tested periodically to ensure that they are functioning properly. A visual check of air gaps is sufficient, but mechanical backflow preventers have to be tested with properly calibrated gauge equipment by a certified individual.

Administrative Rules of Montana:

17.38.305 CROSS-CONNECTIONS: REGULATORY REQUIREMENTS

(1) A cross-connection on a public water supply system must be eliminated by the disconnection of the cross-connection whenever reasonably practicable. Whenever elimination of a cross-connection is not reasonably practicable and the cross-connection creates a health or non-health hazard, the hazard must be eliminated by the insertion into the piping of an approved backflow prevention assembly or device.

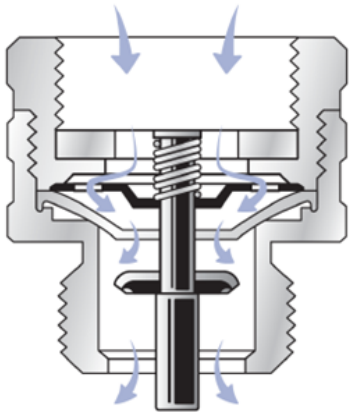
Additional Resources:
Administrative Rules of Montana: Cross-Connections in Drinking Water 17.38.301—312 http://www.mtrules.org
American Backflow Prevention Association https://abpa.site-ym.com/
Environmental Protection Agency Cross Connection Control Manual (2003) http://nepis.epa.gov
Foundation for Cross-Connection Control and Hydraulic Research https://fccchr.usc.edu/introduction.html

Montana Department of Environmental Quality
Public Water Supply Bureau
Telephone: (406) 444-4400
Website: http://deq.mt.gov/water/drinkingwater
DEQ Contacts: https://directory.mt.gov/govt/state-dir/agency/deq

DEQ
Montana Department of Environmental Quality

HBVB: Hose Bibb Vacuum Breaker

Example for illustrative purposes only.
Valves differ by model and manufacturer.



Mechanical Description:
These small devices are a specialized application of the atmospheric vacuum breaker and consist of a spring-loaded check valve that seals against an atmospheric outlet when water supply pressure is turned on. When the water supply is turned off, the device vents to atmosphere, thus protecting against backsiphonage conditions.

Applications:
Hydrants, hose lines, sill cocks, irrigation systems, industrial systems and agricultural systems, and isolation protection.

Limitations:
An atmospheric vacuum breaker does not protect against backpressure and will fail to operate properly if there is a shut-off valve installed downstream.

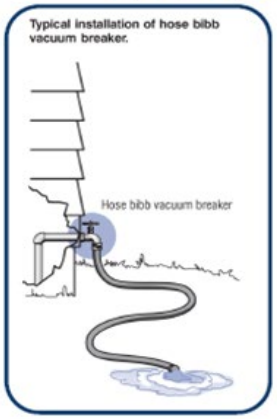
Installation Guidelines:
Attached to sill cocks and connected to outlets such as garden hoses, slop sink hoses. Manual drain options are available, together with tamper-proof versions.

Protection:
An atmospheric/hose bib vacuum breaker is designed to protect against a non-health hazard (i.e., pollutant) or a health hazard (i.e., contaminant) under a backsiphonage condition only.

Hazard Rating:
Health hazards and non-health hazards.

Pressure Condition:
Device may not be subjected to continuous pressure, may only be used for twelve hours out of any twenty-four-hour period and may have no shutoff valves downstream.

Hydraulics, Orientation and Rule Requirements



Requirements for Public Water Supplies:
As mandated by the federal Safe Drinking Water Act, water suppliers are responsible for ensuring that the water they supply meets federal primary drinking water regulations and is delivered to consumers without compromising water quality due to its distribution system. Water utilities may want to implement a cross connection program to stave off any problems that could occur.

Mechanical backflow preventers have internal seals, springs, and moving parts that are subject to fouling, wear, or fatigue. Also, mechanical backflow preventers and air gaps can be bypassed. Therefore, all backflow preventers have to be tested periodically to ensure that they are functioning properly. A visual check of air gaps is sufficient, but mechanical backflow preventers have to be tested with properly calibrated gauge equipment by a certified individual.

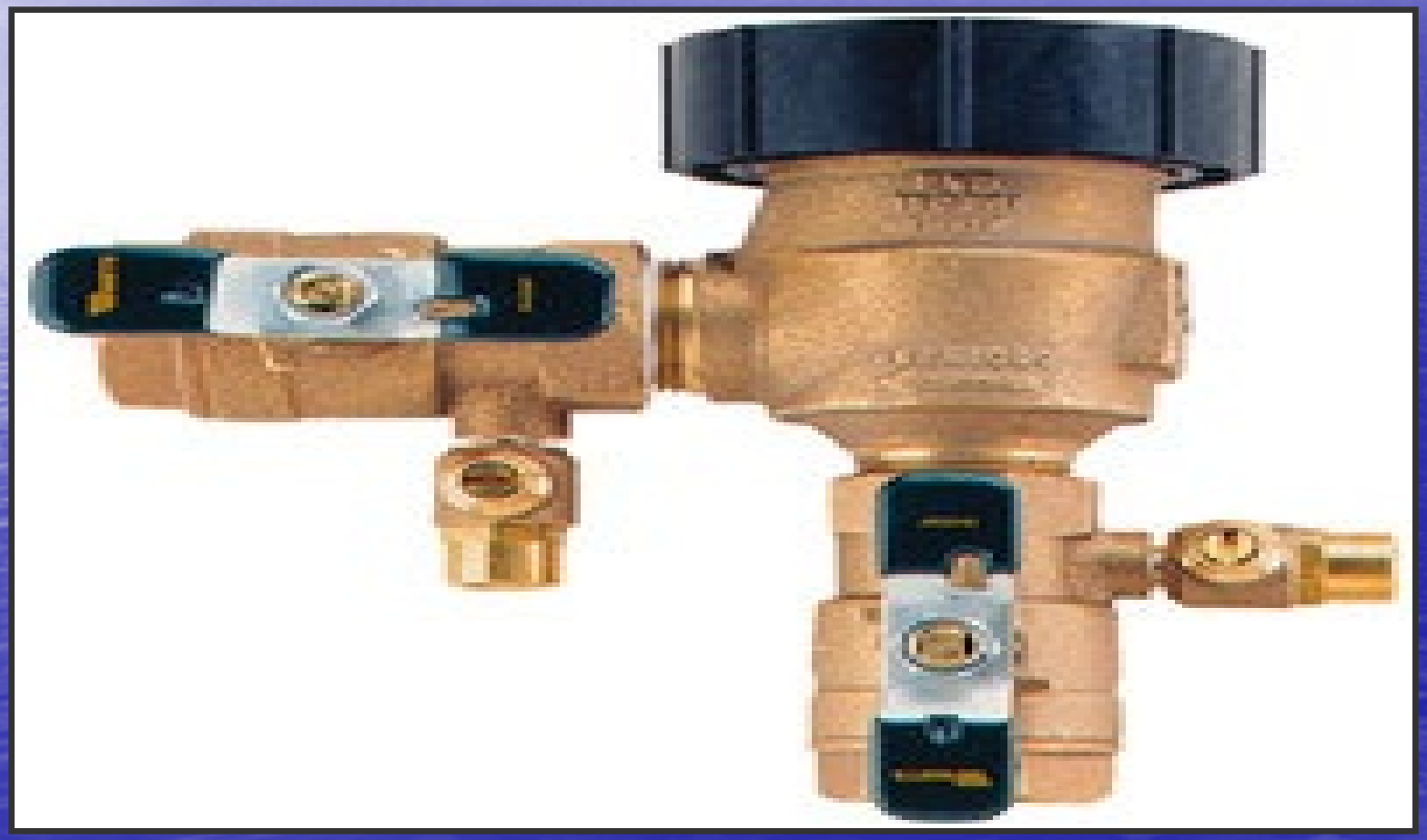
Administrative Rules of Montana:
17.38.305 CROSS-CONNECTIONS: REGULATORY REQUIREMENTS
(1) A cross-connection on a public water supply system must be eliminated by the disconnection of the cross-connection whenever reasonably practicable. Whenever elimination of a cross-connection is not reasonably practicable and the cross-connection creates a health or non-health hazard, the hazard must be eliminated by the insertion into the piping of an approved backflow prevention assembly or device.

Additional Resources:
Administrative Rules of Montana: Cross-Connections in Drinking Water 17.38.301—312 http://www.mtrules.org
American Backflow Prevention Association https://abpa.site-ym.com/
Environmental Protection Agency Cross Connection Control Manual (2003) http://nepis.epa.gov
Foundation for Cross-Connection Control and Hydraulic Research https://fccchr.usc.edu/introduction.html

Montana Department of Environmental Quality
Public Water Supply Bureau
Telephone: (406) 444-4400
Website: http://deq.mt.gov/water/drinkingwater
DEQ Contacts: https://directory.mt.gov/govt/state-dir/agency/deq

Questions….

3. Pressure Vacuum Breaker Assembly



Pressure Vacuum Breaker Assembly- PVB

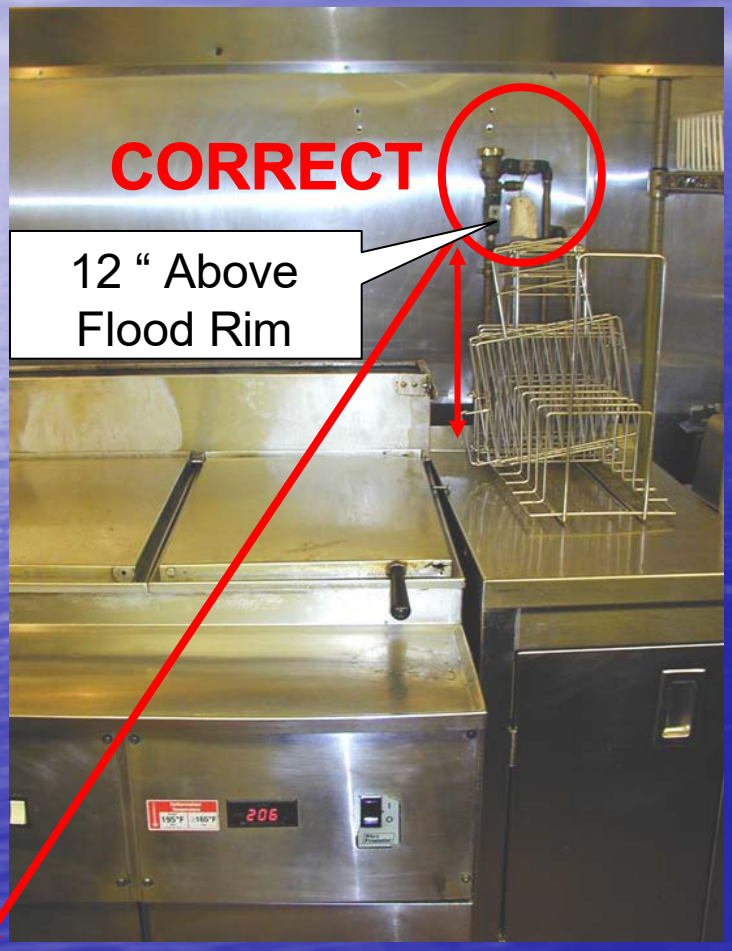
-Can be under constant pressure and downstream valves

-Use for low and high hazards

-**Limitations:** *not recommended against backpressure*

-**Disadvantages:** *dump water everywhere in operation*

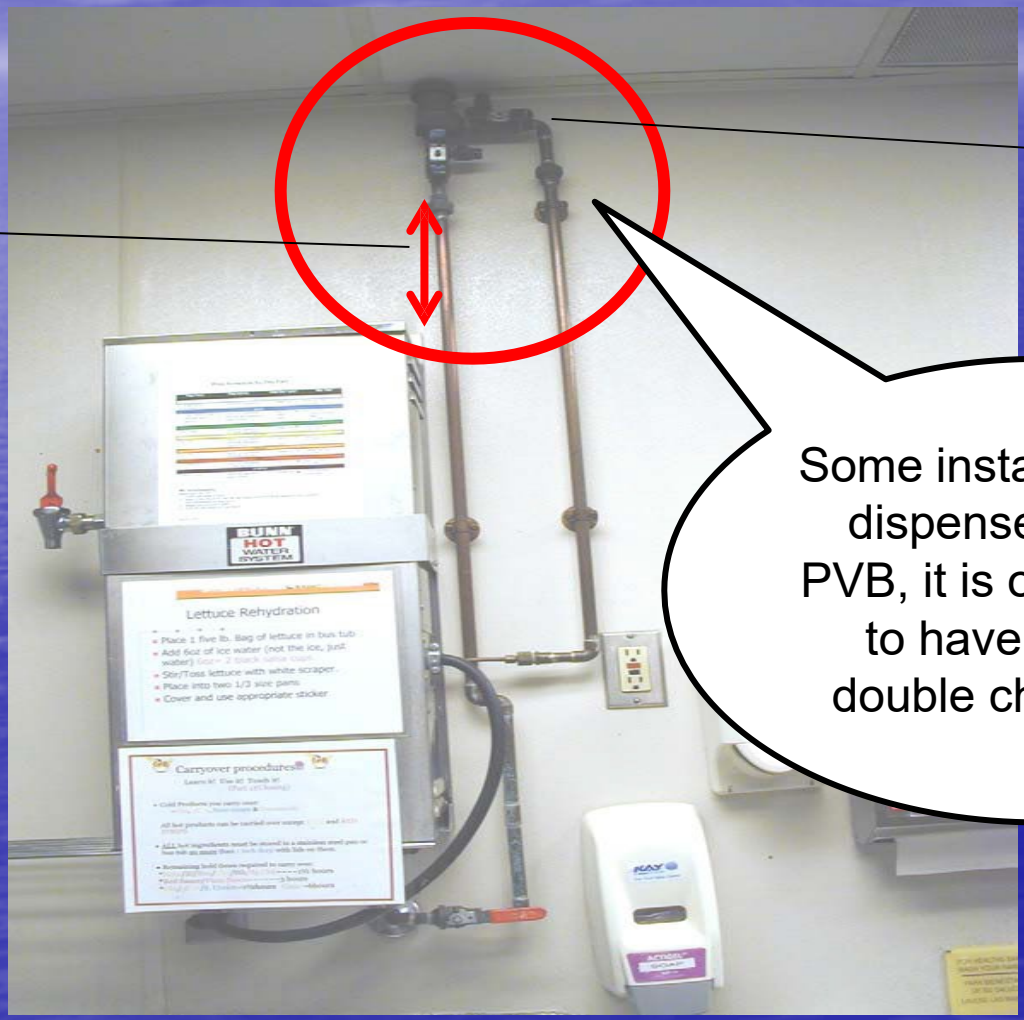
Rethermalizer



Spill Resistant Pressure Vacuum Breaker – ASSE 1056

Atmospheric Vacuum Breaker – ASSE 1001

Instant Hot Water Dispenser



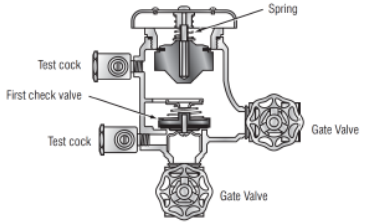
Spill-Resistant Vacuum Breaker: SVB - ASSE 1056

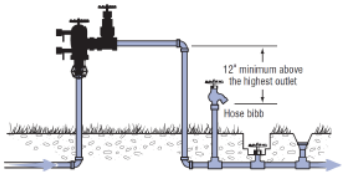
- Similar to the PVB - ASSE 1020.
- Ideal for indoor applications where spillage presents an issue.

PVB: Pressure Vacuum Breaker

Example for illustrative purposes only.
Valves differ by model and manufacturer.

Pressure vacuum breaker





Mechanical Description:
An assembly containing an independently operating internally loaded check valve and an independently operating loaded air inlet valve located on the discharge side of the check valve. The assembly is to be equipped with properly located resilient seated test cocks and tightly closing resilient seated shutoff valves attached at each end of the assembly.

Applications:
Irrigation systems, industrial systems, agricultural systems, and isolation protection.

Limitations:
Not recommended against backpressure.

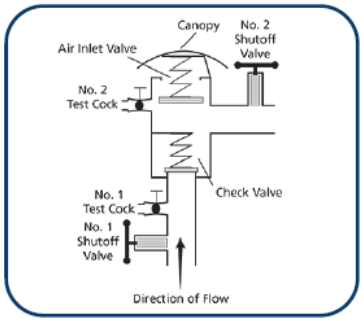
Installation Guidelines:
A pressure vacuum breaker must be installed at least twelve inches above all downstream piping and outlets. The critical level (C/L) of the valve shall be the bottom of the valve body unless otherwise indicated. Must be installed where access for testing is feasible, safe and while in service. Supplied valves are part of the approved assembly.

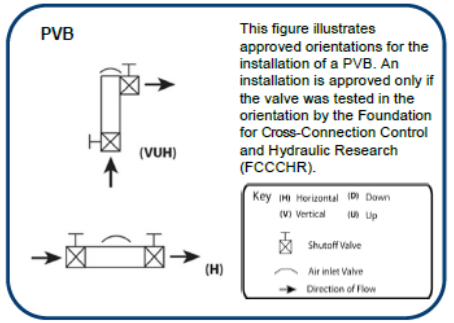
Protection:
A pressure vacuum breaker is designed to protect against a non-health hazard (i.e., pollutant) or a health hazard (i.e., contaminant) under a backsiphonage condition only.

Hazard Rating:
Health hazards and non-health hazards.

Pressure Condition:
Assembly may be subjected to continuous pressure and may have downstream valves.

Hydraulics, Orientation and Rule Requirements





This figure illustrates approved orientations for the installation of a PVB. An installation is approved only if the valve was tested in the orientation by the Foundation for Cross-Connection Control and Hydraulic Research (FCCCHR).

Requirements for Public Water Supplies:
As mandated by the federal Safe Drinking Water Act, water suppliers are responsible for ensuring that the water they supply meets federal primary drinking water regulations and is delivered to consumers without compromising water quality due to its distribution system. Water utilities may want to implement a cross connection program to stave off any problems that could occur.

Mechanical backflow preventers have internal seals, springs, and moving parts that are subject to fouling, wear, or fatigue. Also, mechanical backflow preventers and air gaps can be bypassed. Therefore, all backflow preventers have to be tested periodically to ensure that they are functioning properly. A visual check of air gaps is sufficient, but mechanical backflow preventers have to be tested with properly calibrated gauge equipment by a certified individual.

Administrative Rules of Montana:
17.38.305 CROSS-CONNECTIONS: REGULATORY REQUIREMENTS
(1) A cross-connection on a public water supply system must be eliminated by the disconnection of the cross-connection whenever reasonably practicable. Whenever elimination of a cross-connection is not reasonably practicable and the cross-connection creates a health or non-health hazard, the hazard must be eliminated by the insertion into the piping of an approved backflow prevention assembly or device.

Additional Resources:
Administrative Rules of Montana: Cross-Connections in Drinking Water 17.38.301—312 http://www.mtrules.org
American Backflow Prevention Association https://abpa.site-ym.com/
Environmental Protection Agency Cross Connection Control Manual (2003) http://nepis.epa.gov
Foundation for Cross-Connection Control and Hydraulic Research https://fccchr.usc.edu/introduction.html

Montana Department of Environmental Quality
Public Water Supply Bureau
Telephone: (406) 444-4400
Website: http://deq.mt.gov/water/drinkingwater
DEQ Contacts: https://directory.mt.gov/govt/state-dir/agency/deq

Questions….

4. Double Check Valve Assembly

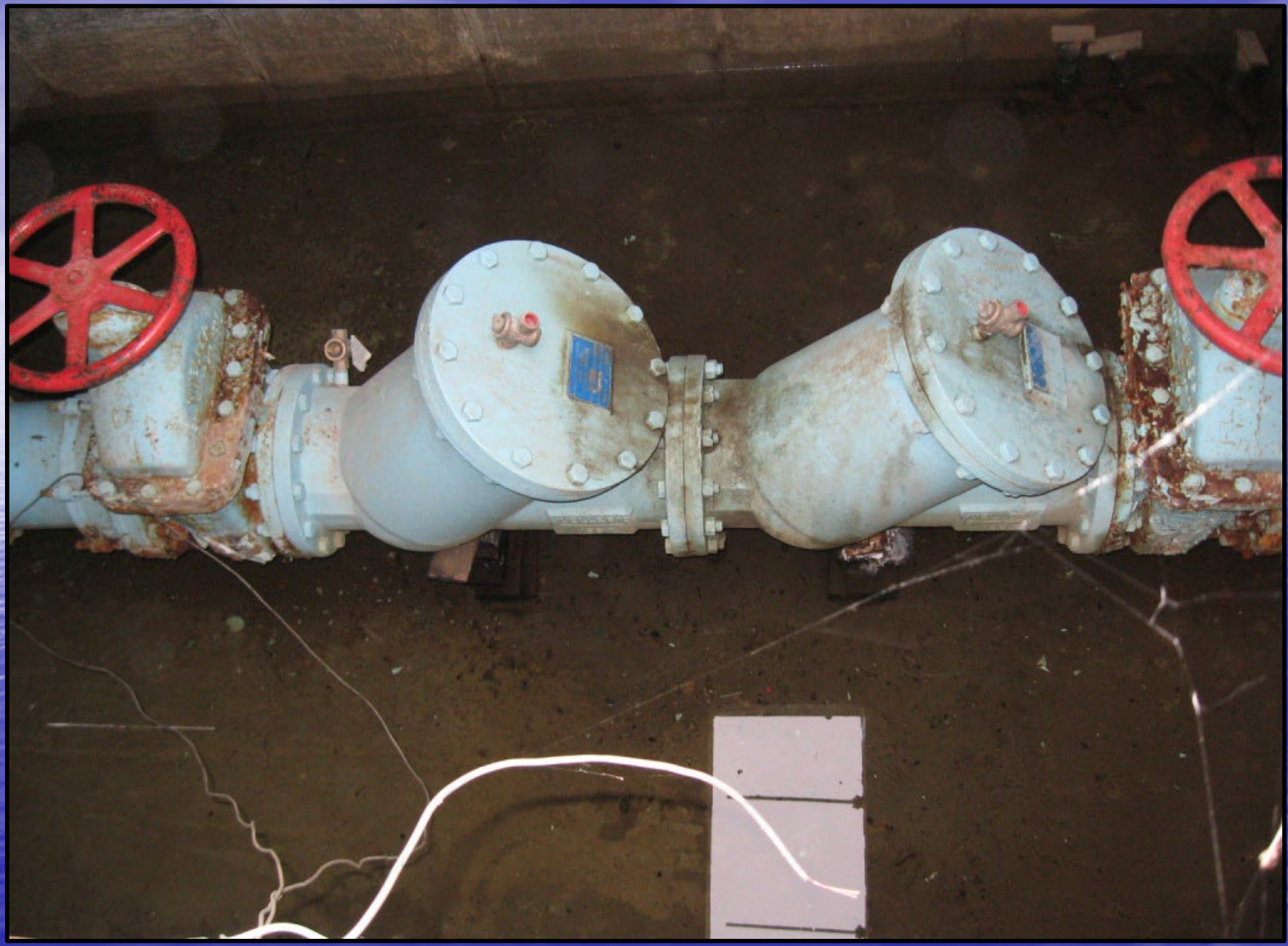
Double Check Valve Assembly- DC

-In line and underground installation, no water discharge

-Use for low hazard backflow only

-**Limitations:** *for objectionable non-toxic connections*

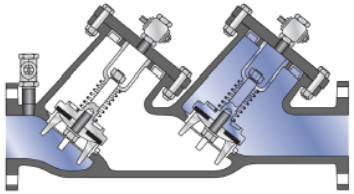
-**Disadvantages:** *questionable protection*



DC: Double Check Valve

Example for illustrative purposes only.
Valves differ by model and manufacturer.

Double check valve.



Mechanical Description:
An assembly composed of two independently acting, approved check valves, including tightly closing resilient seated shutoff valves attached at each end of the assembly and fitted with properly located resilient seated test cocks.

Applications:
Fire connections, food industry, and containment protection for consecutive water systems.
This assembly shall only be used to protect against a non-health hazard (i.e., pollutant).

Limitations:
The double check is a closed system with no way to observe whether the internal check valves are functioning properly or if debris is impeding full closure. This presents two problems: (1) The only method for detecting if the internal check valves are functioning properly is to have a qualified professional conduct a full test, and (2) no remedy exists in the event of a malfunction of the valve closures.

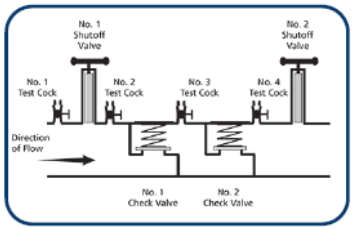
Installation Guidelines:
Must be installed where access for testing is feasible, safe and while in service. Supplied valves are part of the approved assembly.

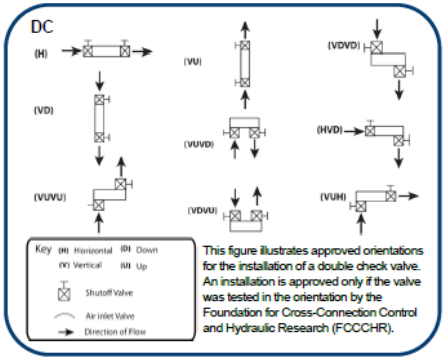
Protection:
A double check valve is designed to protect against backsiphonage and backpressure, though protection is questionable, see Limitations above.

Hazard Rating:
Non-health hazards.

Pressure Condition:
Assembly may be subjected to continuous pressure.

Hydraulics, Orientation and Rule Requirements





This figure illustrates approved orientations for the installation of a double check valve. An installation is approved only if the valve was tested in the orientation by the Foundation for Cross-Connection Control and Hydraulic Research (FCCCHR).

Requirements for Public Water Supplies:
As mandated by the federal Safe Drinking Water Act, water suppliers are responsible for ensuring that the water they supply meets federal primary drinking water regulations and is delivered to consumers without compromising water quality due to its distribution system. Water utilities may want to implement a cross connection program to stave off any problems that could occur.

Mechanical backflow preventers have internal seals, springs, and moving parts that are subject to fouling, wear, or fatigue. Also, mechanical backflow preventers and air gaps can be bypassed. Therefore, all backflow preventers have to be tested periodically to ensure that they are functioning properly. A visual check of air gaps is sufficient, but mechanical backflow preventers have to be tested with properly calibrated gauge equipment by a certified individual.

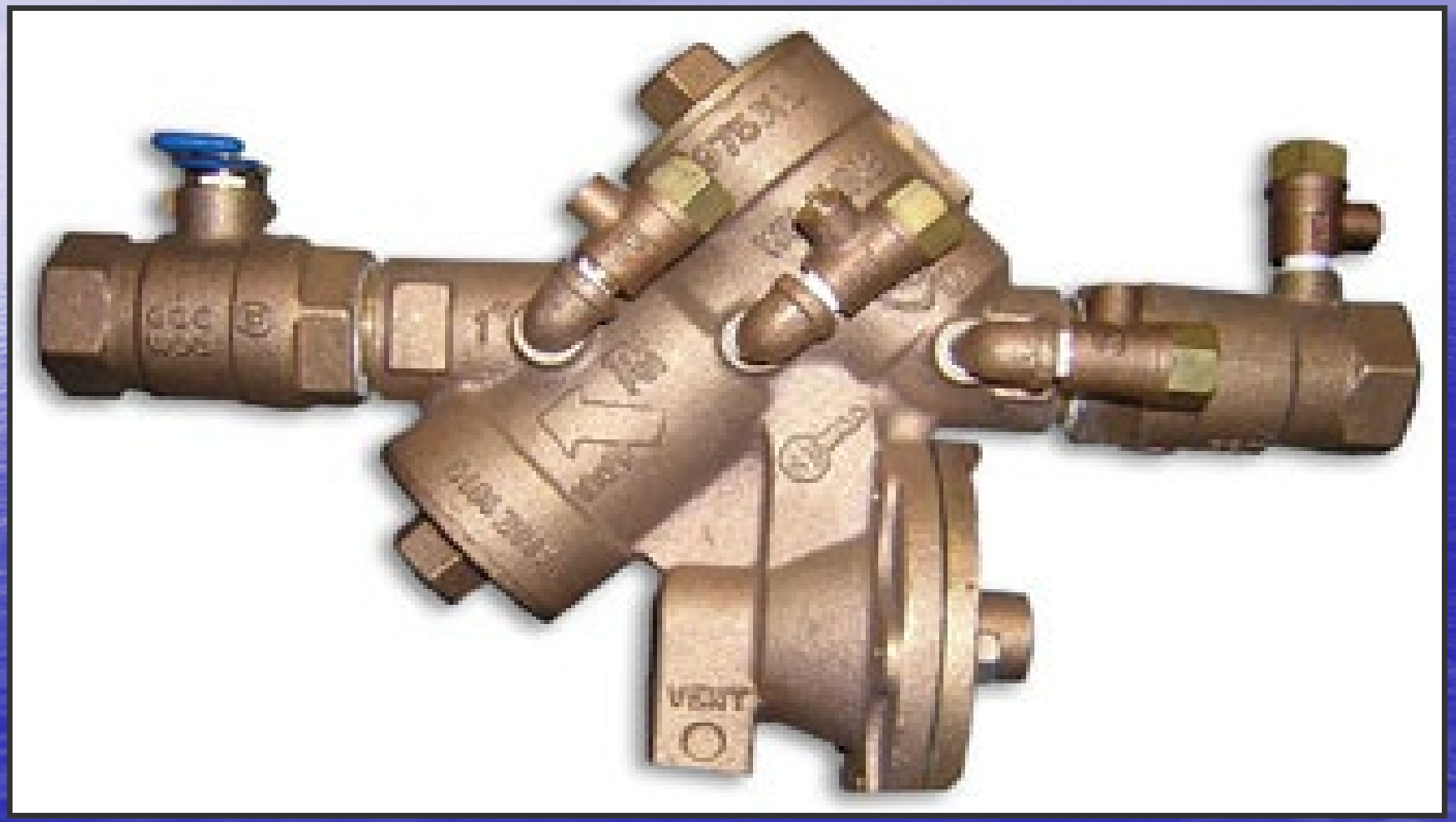
Administrative Rules of Montana:
17.38.305 CROSS-CONNECTIONS: REGULATORY REQUIREMENTS
(1) A cross-connection on a public water supply system must be eliminated by the disconnection of the cross-connection whenever reasonably practicable. Whenever elimination of a cross-connection is not reasonably practicable and the cross-connection creates a health or non-health hazard, the hazard must be eliminated by the insertion into the piping of an approved backflow prevention assembly or device.

Additional Resources:
Administrative Rules of Montana: Cross-Connections in Drinking Water 17.38.301—312 http://www.mtrules.org
American Backflow Prevention Association https://abpa.site-ym.com/
Environmental Protection Agency Cross Connection Control Manual (2003) http://nepis.epa.gov
Foundation for Cross-Connection Control and Hydraulic Research https://fccchr.usc.edu/introduction.html

Montana Department of Environmental Quality
Public Water Supply Bureau
Telephone: (406) 444-4400
Website: http://deq.mt.gov/water/drinkingwater
DEQ Contacts: https://directory.mt.gov/govt/state-dir/agency/deq

Questions….

5. Reduced Pressure Zone Assembly



Reduced Pressure Zone Assembly- RPZ RP

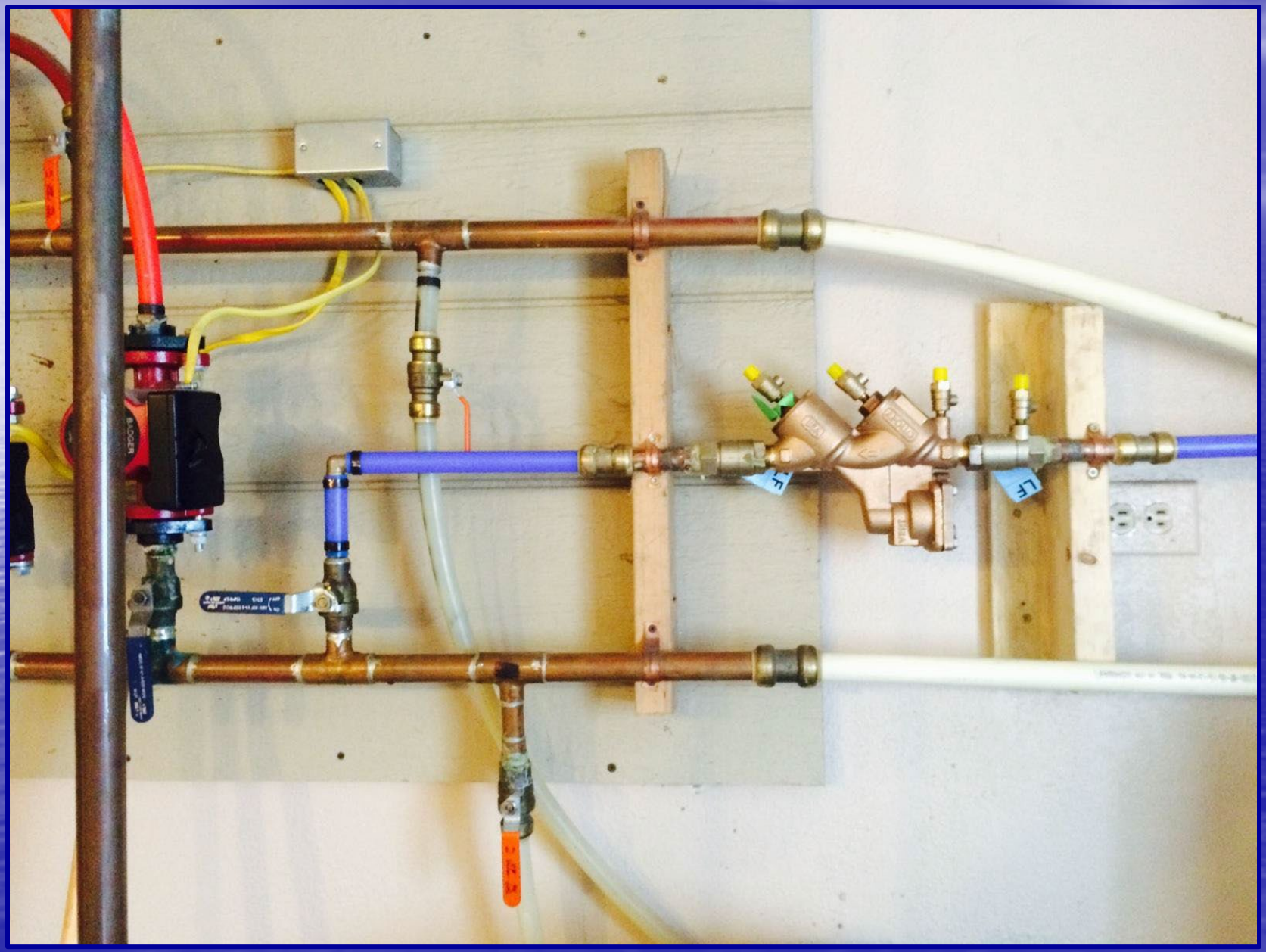
-In line ultimate protection

-Use for all degrees of hazard under all pressure conditions

-**Limitations:** *size generally large but getting smaller*

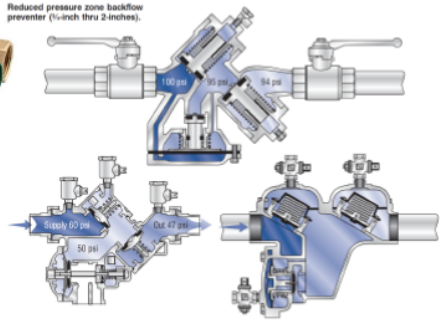
-**Disadvantages:** *Will dump water when functioning*


VENT



RP: Reduced Pressure Assembly

Example for illustrative purposes only.
Assemblies differ by model and manufacturer.



Mechanical Description:
An assembly containing two independently acting approved check valves together with a hydraulically operating, mechanically independent pressure differential relief valve located between the check valves and at the same time below the first check valve. The unit shall include properly located resilient seated test cocks and tightly closing resilient seated shutoff valves at each end of the assembly.

Applications:
Irrigation systems, boilers, hydrants, industrial systems, agricultural systems, containment, and isolation protection.

Limitations:
Not to be used for backflow protection of sewage or reclaimed water. A normally functioning reduced pressure assembly may discharge intermittently from the relief valve and the relief valve port should be air gapped to a drain if installed indoors. Assembly must never be installed underground or in a pit.

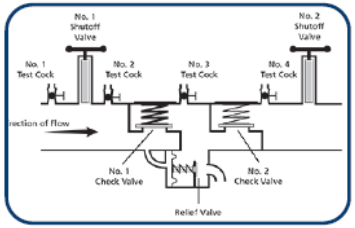
Installation Guidelines:
A reduced pressure assembly must be installed so that the relief valve port is at least twelve inches above finished grade. The critical level (C/L) of the valve shall be the bottom of the valve body unless otherwise indicated and must allow test equipment clearance. Must be installed where access for testing is feasible, safe and while in service. Supplied valves are part of the approved assembly.

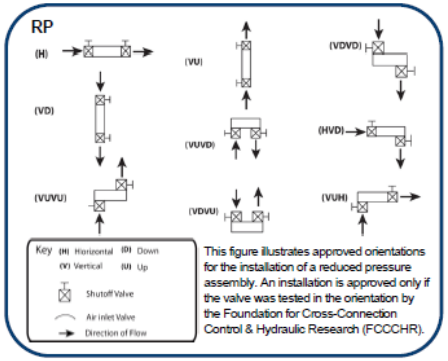
Protection:
A reduced pressure assembly is designed to protect against a non-health hazard (i.e., pollutant) or a health hazard (i.e., contaminant).

Hazard Rating:
Health hazards and non-health hazards.

Pressure Condition:
Assembly may be subjected to continuous pressure.

Hydraulics, Orientation and Rule Requirements





This figure illustrates approved orientations for the installation of a reduced pressure assembly. An installation is approved only if the valve was tested in the orientation by the Foundation for Cross-Connection Control & Hydraulic Research (FCCCHR).

Requirements for Public Water Supplies:
As mandated by the federal Safe Drinking Water Act, water suppliers are responsible for ensuring that the water they supply meets federal primary drinking water regulations and is delivered to consumers without compromising water quality due to its distribution system. Water utilities may want to implement a cross connection program to stave off any problems that could occur.

Mechanical backflow preventers have internal seals, springs, and moving parts that are subject to fouling, wear, or fatigue. Also, mechanical backflow preventers and air gaps can be bypassed. Therefore, all backflow preventers have to be tested periodically to ensure that they are functioning properly. A visual check of air gaps is sufficient, but mechanical backflow preventers have to be tested with properly calibrated gauge equipment by a certified individual.

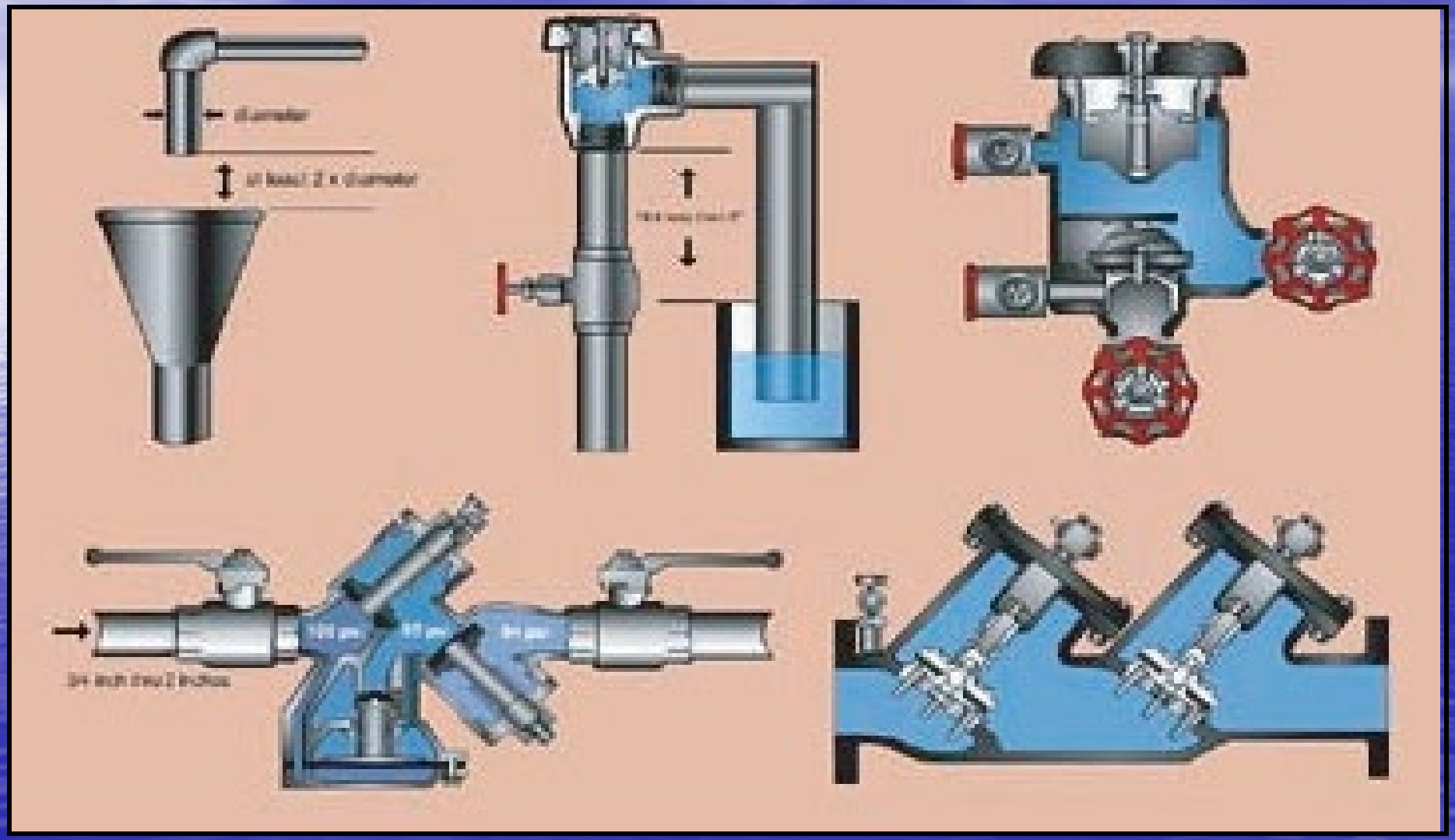
Administrative Rules of Montana:
17.38.305 CROSS-CONNECTIONS: REGULATORY REQUIREMENTS
(1) A cross-connection on a public water supply system must be eliminated by the disconnection of the cross-connection whenever reasonably practicable. Whenever elimination of a cross-connection is not reasonably practicable and the cross-connection creates a health or non-health hazard, the hazard must be eliminated by the insertion into the piping of an approved backflow prevention assembly or device.

Additional Resources:
Administrative Rules of Montana: Cross-Connections in Drinking Water 17.38.301—312 http://www.mtrules.org
American Backflow Prevention Association https://abpa.site-ym.com/
Environmental Protection Agency Cross Connection Control Manual (2003) http://nepis.epa.gov
Foundation for Cross-Connection Control and Hydraulic Research https://fcchr.usc.edu/introduction.html

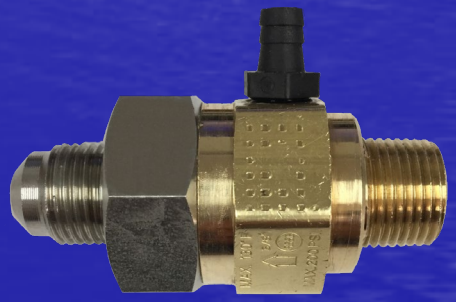
Montana Department of Environmental Quality
Public Water Supply Bureau
Telephone: (406) 444-4400
Website: http://deq.mt.gov/water/drinkingwater
DEQ Contacts: https://directory.mt.gov/govt/state-dir/agency/deq

Questions….

RECAP

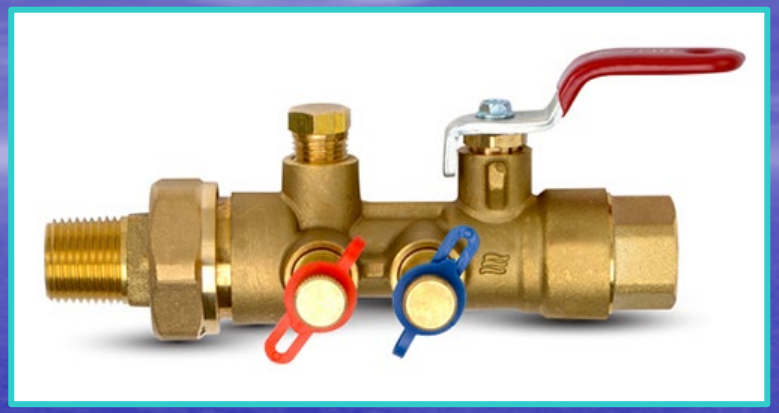


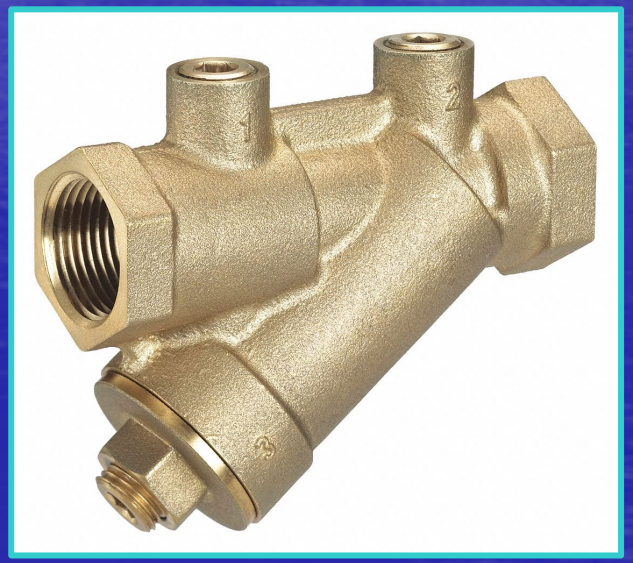
Vented Dual Check



Dual Checks and Dual Check with Intermediate Atmospheric Vent

Flow balancing valves





Trap primers

Pressure Reducing valves

Check valves

Application-- 3 Questions…

- *What type of Cross-Connection is it?*
  - *Indirect?*
  - *Direct?*
- *What is the degree of Hazard?*
  - *Non-health hazard?*
  - *Health hazard?*
- *Is it under continuous use (or pressure)?*

Application Guide

BACKFLOW PREVENTION ASSEMBLY GENERAL APPLICATIONS *

	Non-Health Hazard (POLLUTANT)		Health Hazard (CONTAMINANT)		Sewage	
	BACKSIPHONAGE	BACKPRESSURE	BACKSIPHONAGE	BACKPRESSURE	BACKSIPHONAGE	BACKPRESSURE
AIR GAP	X	X	X	X	X	X
RP	X	X	X	X		
DC	X	X				
PVB	X		X			
SVB	X		X			
AVB	X		X			

* *NOTE: These are general guidelines. Check with local administrative authority(s) for local applications.*

TABLE 4-1
BACKFLOW PREVENTION ASSEMBLY GENERAL APPLICATIONS

Things to remember…

-A single check valve is not a backflow preventer

-Two single check valves do not make a double check assembly

-No connections to a sewer line are allowed with assemblies or devices as backflow preventers

-Bypass lines around a preventer require the same protection as the original line

-Backflow preventers and water heating units require thermal expansion tanks

-Backflow prevention assemblies require annual testing


It is
mandatory
that you have
your backflow
assembly tested
every year

AMERICAN BACKFLOW PREVENTION ASSOCIATION

POSITION STATEMENT

CONCERNING

FIELD TESTING OF BACKFLOW PREVENTION ASSEMBLIES

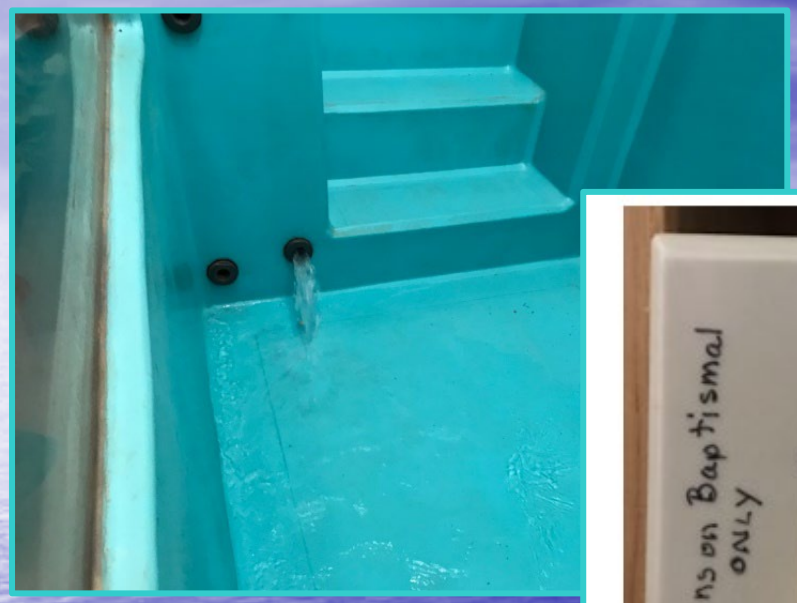
In pursuit of the stated goals of the American Backflow Prevention Association of protecting the quality and the integrity of the drinking water being delivered to the public for consumption, the Board of Directors feel that a Position Statement regarding the field testing of backflow prevention assemblies is needed.

It is understood that any and all mechanical devices are subject to failure due to age, wear, damage, corrosive water, and manufacturing flaws. The American Backflow Prevention Association supports regular field testing and maintenance of backflow prevention assemblies to ensure their proper operation, to protect the public water supply and the financial investment of the consumer by extending the life of the assembly. The actual frequency of field testing of each assembly must be determined by the local jurisdiction having authority. However, the American Backflow Prevention Association concurs with the various manufacturers' recommended practice of field testing all backflow prevention assemblies after initial installation, after repairs of any kind are made to the assembly and at least once annually. This is also consistent with the prevailing Building and Plumbing Codes utilized in the United States and Canada. The Association advocates using test equipment and procedures that will accurately reflect the internal working condition of the assembly.

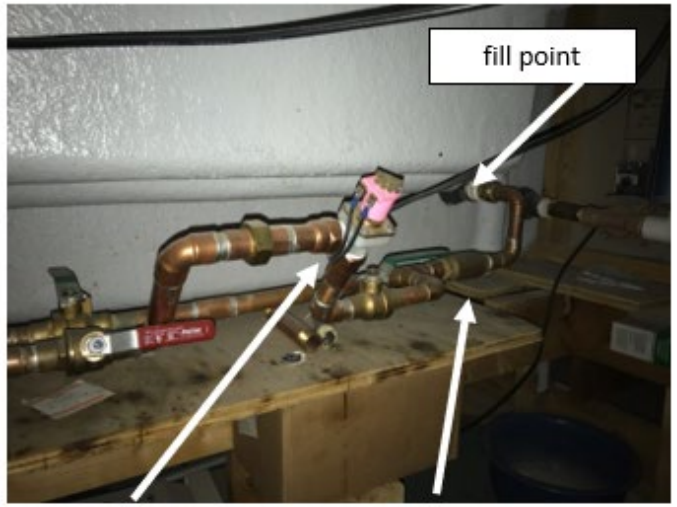
Resources

- ASSE home:
  - http://www.asse-plumbing.org/
- Watts Backflow Prevention Page:
  - http://www.watts.com/pro/_backflowprevention.asp
- American Backflow Prevention Association:
  - http://www.abpa.org/

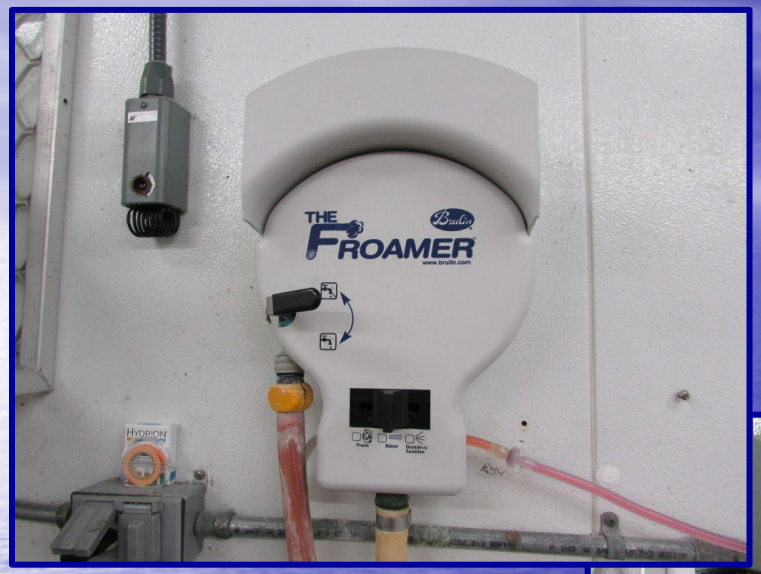
Questions….



Holy CR_ _!



In order to fill the unit, the solenoid valve is turned on and opens. There is a check valve located between the solenoid valve and tub fill injector.


THE
FROAMER
Brulin
www.brulin.com
HYDRION


HYDRION


ZUN
400


09/27/2016

Right

Wrong

Proper Backflow Preventer on a Sanitary Station Water Hose

Must be ASSE 1001. Note: This is an example of an ASSE 1001 Atmospheric Vacuum Breaker.


07/16/2020

Hydrant set up for long term use?

No backflow protection at all

Needs an RP

Cross Connections-Backflow Prevention

Questions?

THANK YOU
Karl Carlson, MDEQ
247-4444
kcarlson2@mt.gov

- Slides created by Christy Lupu, Oakland County Health Division