

Denver, CO | February 5 – 8

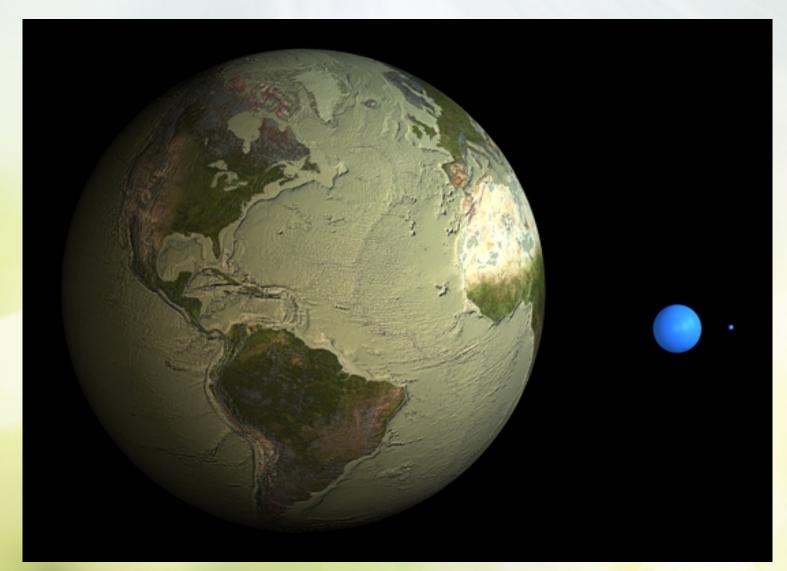
Advanced Backflow Prevention for Irrigation

Paul Wait, Zurn Industries

Principles of Backflow Prevention

"Protecting and maintaining the quality of **our water supply** is one of the most important issues facing us today."

Perspective of fresh water supply



Presentation Outline

- Backflow Prevention and Cross Connection
- Installation Requirements
- Selecting an RP over a PVB
- RP Functionality
- Advanced Troubleshooting
- Connected Backflow

Backflow Prevention & Cross Connection Control

- Backflow preventers required by plumbing code — point of connection and point of use
- Established by Safe Drinking Water Act (1974)
- Enforced by local Authority Having Jurisdiction

 AHJ defines enforces programs, testing requirements
- Backflow preventers are installed to provide water conservation, liability mitigation and...
 ...Water System Safety!

What is Backflow?

Backflow is the unwanted reversal of flow of water or mixture of water with other substances into the potable water supply from any source

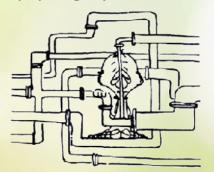
"For backflow to occur, a <u>CROSS CONNECTION</u> of some type must also be present."

What is a Cross Connection?

Any ACTUAL or <u>POTENTIAL</u> unprotected connection between the potable water system and any other source through which a substance, other than potable water, may be introduced

Direct (ACTUAL)

Physical connection between two piping systems



Indirect (POTENTIAL)
 Possible cross connection



Cross Connection Examples



Backflow Conditions

Backflow occurs during two conditions:

1. <u>BACKSIPHONAGE</u>

2. <u>BACKPRESSURE</u>

What is Backsiphonage?

"Backsiphonage exists when there is a negative or sub-atmospheric pressure in the supply piping, allowing downstream substances to be siphoned into the potable water supply."

Backsiphonage Causes

- Under-sized pipes
- Pipeline breaks
- Firefighting: high withdrawal rates

What is Backpressure?

"Backpressure conditions exist when a pressure higher than the supply is created in the downstream piping, allowing substances to be pushed into the potable water supply."

Backpressure Causes

- Pumps
- Fertilizer/Chemical Injection Systems
- Elevation changes in a piping system

Degree of Hazard

Backflow Devices are Categorized According to the Degree of Hazard Protection

Low Hazard

- Non-Health Hazard
- Pollutant
- Impairs water quality (Sight, Taste, Smell)
- Will not cause sickness or death

<u>High Hazard</u>

- Health Hazard
- Contaminant
- Impairs water quality (Sight, Taste, Smell)
- Can cause sickness or death

Testable Backflow Preventer Valves

- Reduced Pressure Principle Assemblies (RP or RPZ)
- Double Check Valve Assemblies (DC or DCV)
- Pressure Vacuum Breakers (PVB)

Which Backflow Assembly is Appropriate?

	RP	DC	PVB
Backsiphonage			-
Backpressure			
Low Hazard (Pollution)			-
High Hazard (Contamination)			Ą



Backflow Installation Criteria

Install at least 12" above finish grade or flood level

- –PVB requires 12" above highest piping or outlet
- –Double checks may be installed below grade

Always consult local codes for approvals, installation methods and guidance

#1 Install problem is line flushing to remove debris in the supply lines before putting valve in service

Outdoor Installation Space

Space is always an issue

- Installing around new plantings... they grow!
- Is there room for an enclosure or cage to be added?
- Access required for testing, maintenance, repair





Outdoor Installation Drainage

Drainage For Relief Valve Discharge on RP

- Provide adequate drainage to prevent possible landscape erosion and damage from flooding
- Air Gap to direct relief valve discharge to a drain?



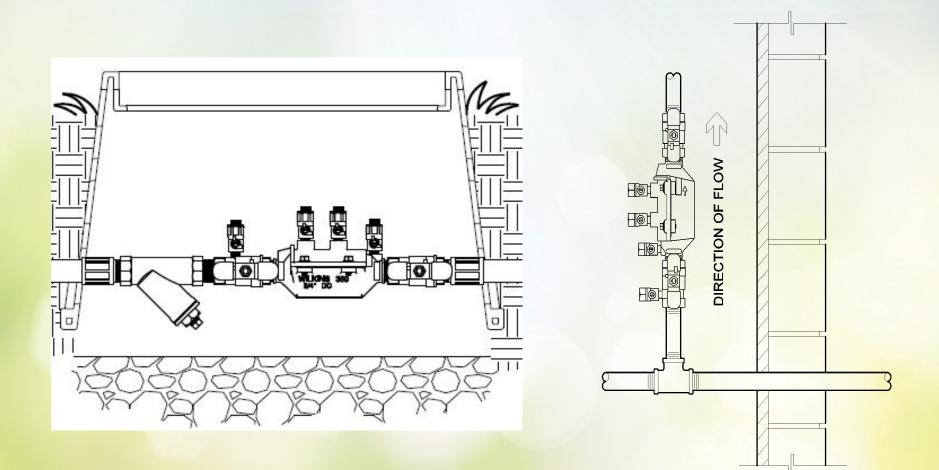
Outdoor Installation Freezing

- Proper winterizing required where freezing exists or else the backflow preventer becomes damaged
- Basic Freeze Protection: pipe wraps, heat tape, backflow blankets
- Advanced Freeze Protection: blow outs, removal from system, specialized Blow-Out tools/options

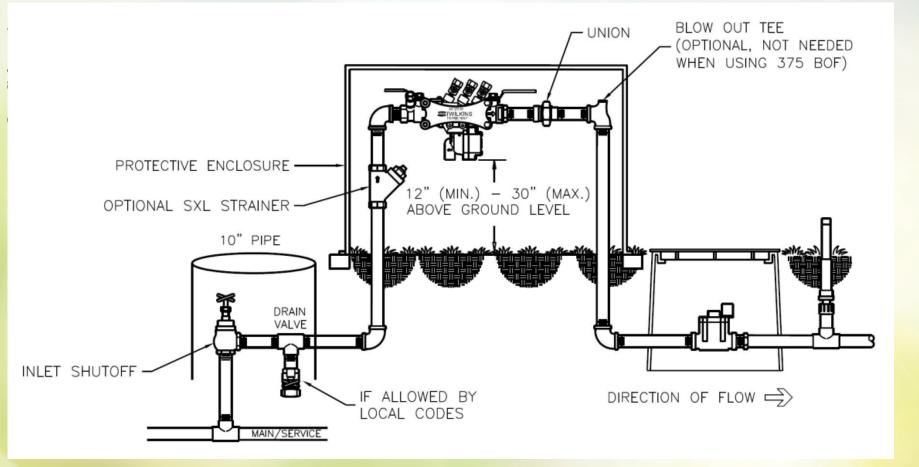




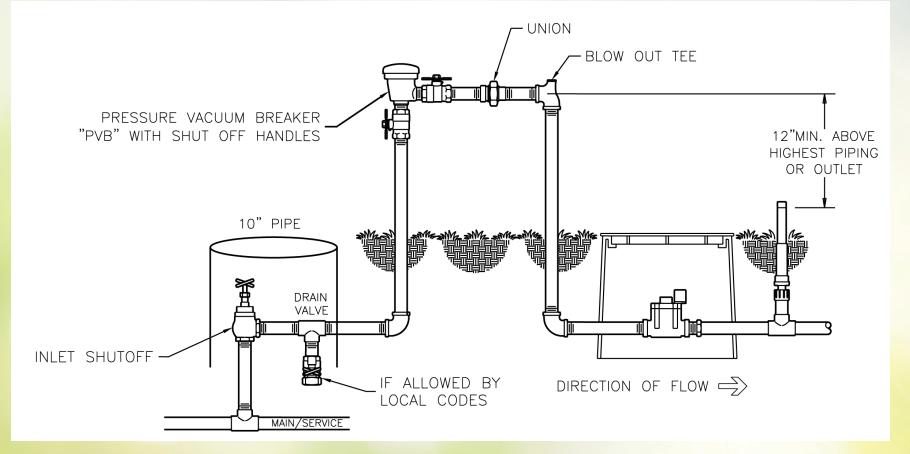
Double Check Valve Installation



Reduced Pressure Principle Assembly Installation



Pressure Vacuum Breaker Installation





Selecting a RP Over a PVB

When to Select an RP Over a PVB

A Pressure Vacuum Breaker (PVB) must be installed at least 12" (min) to 30" (max) above the highest piping or water outlet downstream of the PVB. This installation limitation must be considered, and careful measurements are required to comply with local codes.



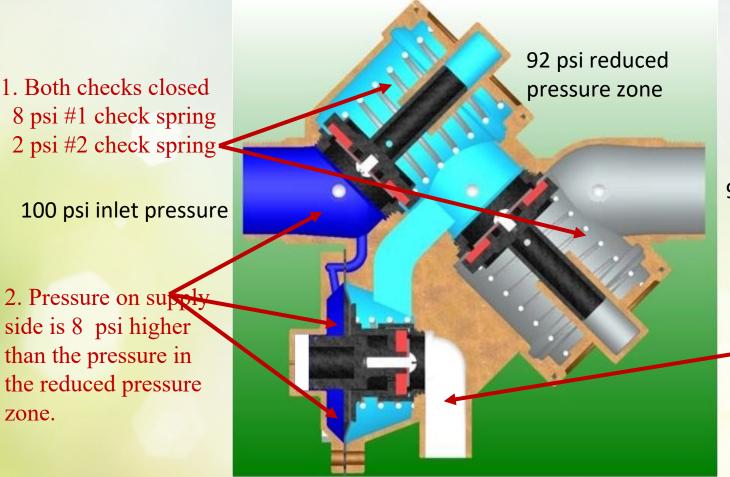
Selecting a RP Over a PVB

A Reduced Pressure Principle Assembly (RP) may be required if any of the below features apply to your irrigation system:

- Hanging baskets
- Elevated planters/potted plants
- Property elevation
- Large potted plants
- Misting devices
- Decks with planters



1. Static (no flow) Condition



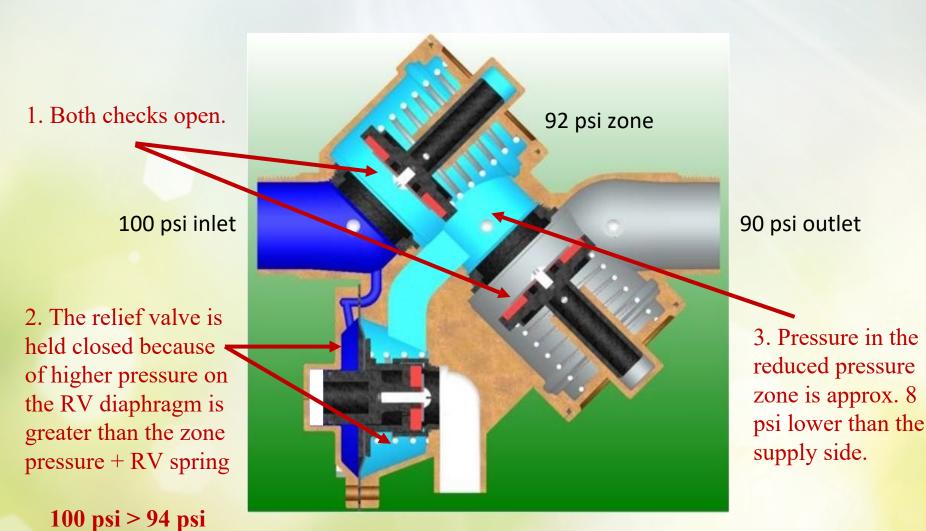
>> Flow Direction >>

90 psi outlet

3. The relief valve is held in a closed position because of the higher pressure on the supply side.

RV spring = 2 psi

2. Normal Flow



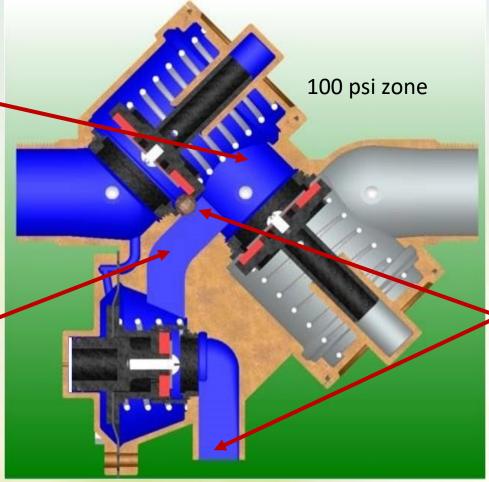
>> Flow Direction >>

3. Static Condition with 1st Check Fouled

1. Fluid leaks from inlet into the reduced pressure zone.

100 psi inlet

 As zone pressure increases to within
 psi of inlet pressure, relief
 valve begins to open and discharge.



>> Flow Direction >>

98 psi outlet

3. The amount of discharge is proportional to the extent of the foul across the 1st check.

RP Troubleshooting

<u>PROBLEM</u>: Steady Relief Valve Discharge (continuous flow, stream or dripping)

CAUSE: Failure in part of the unit, usually a fouled #1 check

- To determine the failure, close #2 shut-off valve
- If discharge stops, the #2 check requires service
- If discharge continues, <u>the #1 check is suspected</u>

RP Troubleshooting

<u>PROBLEM</u>: Steady Relief Valve Discharge (continuous flow, stream or dripping)

CAUSE: Failure suspected to be a fouled #1 check.

- Validate #1 check failure: open #4 test cock, zone valve downstream or hose bibb
- If discharge stops or reduces greatly: #1 check requires service
- If discharge does NOT change: relief valve requires service

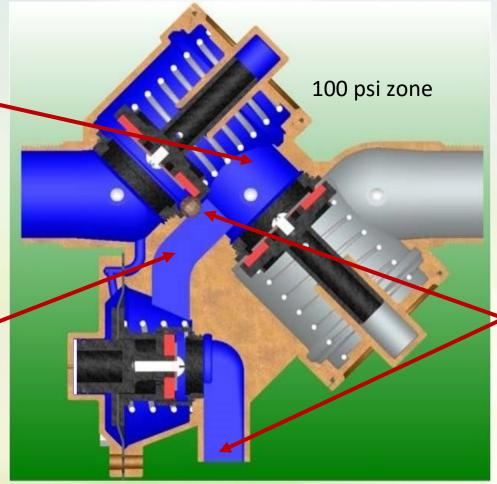
Note: Amount of discharge from relief valve is proportional to extent of the fouled check valve

3. Static Condition with 1st Check Fouled

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100 psi inlet

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>> Flow Direction >>

98 psi outlet

3. The amount of discharge is proportional to the extent of the foul across the 1st check. RP Troubleshooting: Solutions <u>PROBLEM</u>: Steady Relief Valve Discharge (continuous flow, stream or dripping)

#1 CHECK SOLUTIONS:

- A. Inspect #1 check: clean, replace rubber seals, flip seals?
- B. Inspect #1 check seat: nicks, cracks, excessive wear, mineral build up. Replace defective seats, remove build up

RELIEF VALVE SOLUTIONS:

A. Disassemble relief valve: flush thoroughly, inspect, clean all parts. Replace defective parts, remove build up



RP Troubleshooting: Water Hammer

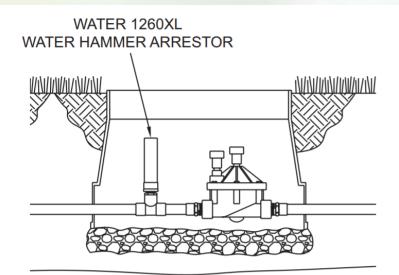
<u>PROBLEM</u>: Intermittent Relief Valve Discharge (sudden/rapid spitting)

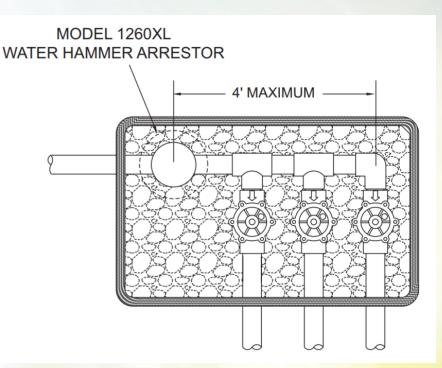
RP verified, functioning <u>correctly</u>, RV discharge caused by system problems

CAUSE: Water Hammer SOLUTIONS:

- A. Install water hammer arrestor(s) near the source
- B. Install in-line spring loaded check valve downstream of backflow as close to source as possible

RP Troubleshooting: Water Hammer







Advanced RP Troubleshooting

<u>PROBLEM</u>: Periodic Dripping from Relief Valve (cyclical discharge)

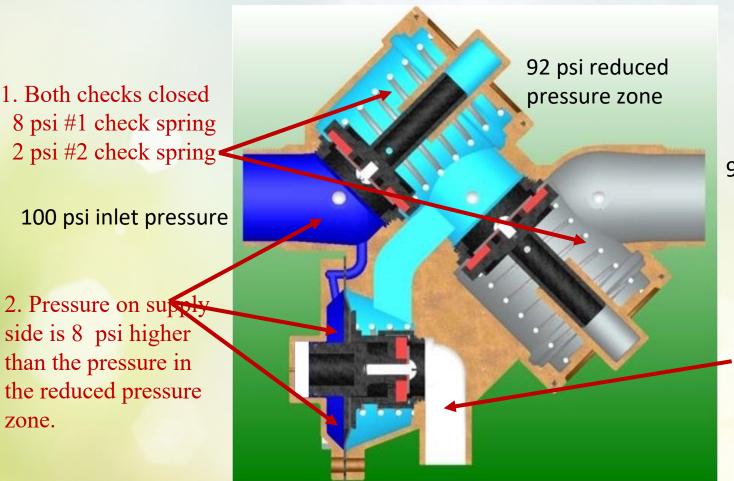
RP verified, functioning <u>correctly</u>, RV discharge caused by system problems

LIKELY CAUSE: System Water Pressure Fluctuations SOLUTIONS:

 Install in line spring loaded single check valve upstream of backflow for isolation

2. Install pressure reducing valve up stream of backflow

1. Static (no flow) Condition



>> Flow Direction >>

90 psi outlet

3. The relief valve is held in a closed position because of the higher pressure on the supply side.

RV spring = 2 psi



PROBLEM: RP Backflow Discharge



SOLUTION: Connected Backflow



Connected Backflow Preventers

Come see us in Booth 506. Let's talk about Connected Backflow.





Denver, CO | February 5 - 8

Thank you!

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