Cross Connection Specialist Class (OAR 333-061-0070-74)

Clackamas Community College: Oregon Backflow Training (OBT)

James T. Nurmi, Ph.D.

503-594-3345

http://depts.clackamas.edu/wet/WET_Backflow_Homepage.aspx

Reduced Pressure Principal Assembly (RP)

Figure 1

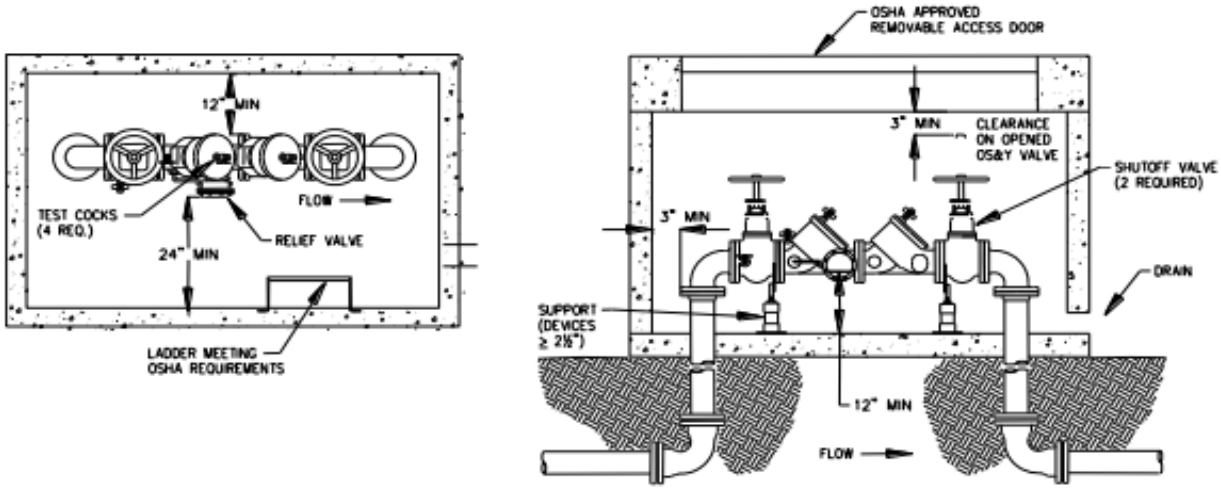


Figure 1. Installation clearances for the RP.

Approved for:	Installation Requirements
Backsiphonage Backpressure Non-Health Hazard/Pollutant High Health Hazard/Contaminant	• Vertical installation only if approved • Above 100 year flood • Never extended or plugged relief valve • Protected from freezing • Provided approved air gap drain • Shall not be installed in an enclosed vault or box unless a bore-sighted drain to daylight is provided where there is an unrestricted straight-line opening in the enclosure that vents to grade, and is sized and constructed to adequately drain the full flow discharge from the reduced pressure principle backflow prevention assembly thus preventing any potential for submersion of the assembly; • May be installed with less clearances if <= 2” pipes • Not installed > 5’ unless OSHA approved permanent platform • Installation clearances shown in Figure 1.

Double Check Assembly (DC)

Figure 2

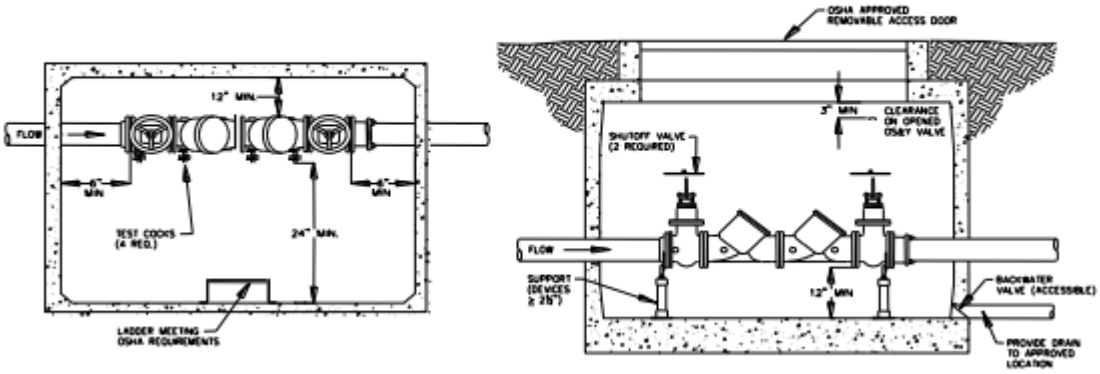


Figure 2. Installation clearances for the DC.

Approved for:	Installation Requirements
Backsiphonage Backpressure Non-Health Hazard/Pollutant	• Vertical and Horizontal installation if listed as H and V • May be installed below grade in a vault provided water-tight test cock plugs or caps • Shall not be subject to continuous immersion • Needs adequate drainage but not connected to sanitary or storm drain • Protected from freezing • May be installed with less clearances if <= 2" pipes • Not installed > 5' unless OSHA approved permanent platform • Installation clearances shown in Figure 2.

Pressure Vacuum Breaker (PVB) or Spill Resistant Vacuum Breaker (SVB) Assemblies

Figure 3

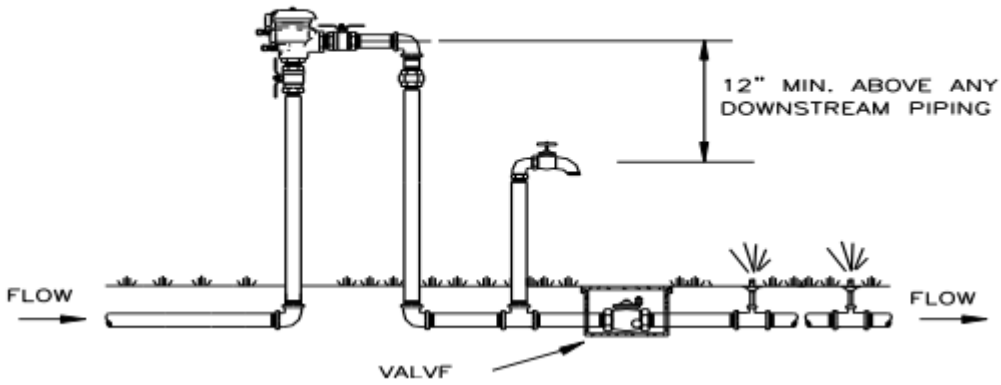


Figure 2. Installation clearances for the DC.

Approved for:	Installation Requirements
Backsiphonage ONLY Non-Health Hazard/Pollutant Health Hazard/Contaminant	• Installed where occasional water discharge ok • Adequate spacing for maintenance and testing • Installed minimum 12” above highest down stream piping and outlets • No means of imposing backpressure • May have downstream valves

Atmospheric Vacuum Breaker (AVB)

Figure 4

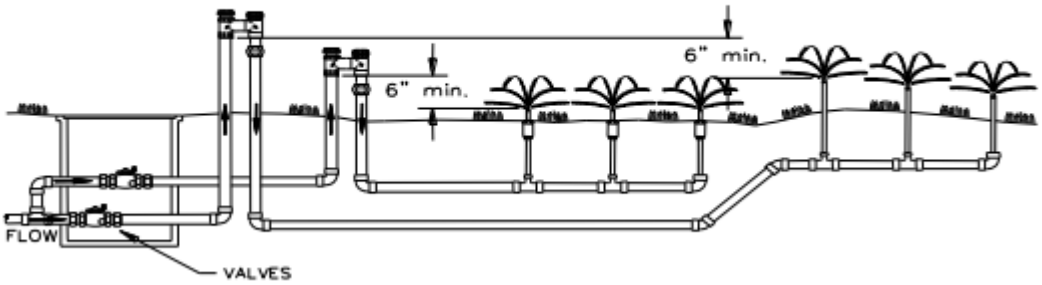


Figure 1. Installation clearances for the RP.

Approved for:	Installation Requirements
Backsiphonage Non-Health Hazard/Pollutant High Health Hazard/Contaminant	• No means of shut-off downstream • Not installed in dusty or corrosive atmosphere • Not subject to flooding • Be used intermittently • Approved under the Oregon Plumbing Specialty code for non-testable devices • No means of shut-off downstream • Not installed in dusty or corrosive atmosphere • Not subject to flooding

Dr. James T. Nurmi, PhD.

Dr. James T. Nurmi, Ph.D. is a faculty instructor in the Engineering Science Department at Clackamas Community College. Jim has been teaching water related courses in the Water & Environmental Technology program for 12 years. He sits on several water related committees including the Oregon Health Authority Cross Connection Health Advisory Board and is a state certified instructor for both back-flow and cross connection specialist state certification courses. Jim has helped organize, schedule, participate and host the Pacific Northwest American Waterworks Association Water short school for the past 12 years, in which water industry professionals obtain continuing education units.

Jim previously worked as a senior research scientist and graduate faculty in the School of Medicine at Oregon Health & Science University. Dr. Nurmi received his B.A. from Gustavus Adolphus College in St. Peter, MN. After which, he worked at Argonne National lab on the physical and chemical immobilization of low-level mixed wastes. From there, he traveled to Oregon, where he completed his Ph.D. in Environmental Science & Engineering. Dr. Nurmi's doctoral dissertation was focused on the electrochemical properties of natural organic matter and of zero valent iron. Dr. Nurmi's research interests are broad, covering topics, such as: drinking water and wastewater, remediation of environmental contaminants, fundamental processes of material corrosion, and the use of electrochemical techniques for the detection and characterization of engineered nanoparticles.

Cross Connection Specialist Renewal Class

The Cross Connection Specialist renewal course offers a 6 hour (0.6 CEU) training that addresses the following topics in accordance with Oregon Health Authority OARs 333-061-0070 through 74.

- Review of cross connection control regulations OAR 333-061-0070 through 0073;
- Review and discussion of recent backflow incidents and identification of cross connections;
- Review and discussion of Cross Connection Specialist safety issues.

The time specific outline of the course is as follow:

8:00-9:00 AM – Instructor Introduction, Student Introductions, Handouts (Notes, Powerpoint Files, Installation Requirements), Overview of Cross Connection Specialist OARs, Cross Connection Definitions

9:10-10:10 AM – Water Contamination: 5 Categories and History of Cross Connection Control

10:20-11:20 AM – Historically relevant and recent backflow incidents. Backflow Preventions Techniques, Devices, and Assemblies

11:30-12:30 PM – Which Backflow Prevention and Installation Requirements

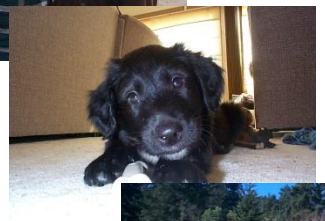
12:30-1:30 – Lunch

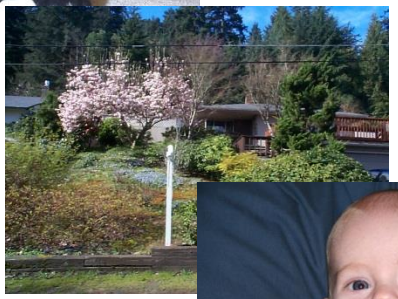
1:30-2:30 – Oregon Administrative Rules 70 through 74 Review

2:40-3:40 – Safety Issues (Physical, Chemical, and Confined Space) with examples.

3:50-4:00 PM – Questions, Comments, Discussion of Pain Points Observed as Cross Connection Specialists

Personal Background





B.A., Gustavus Adolphus College, 1997, Major: Biology

Argonne National Laboratory, Energy Technology Division (97-98)

Started at OGI in non-thesis Masters program, 1999

Got Married, 1999

Started PhD work at OGI, 2001

Adopted 2 blind cats, 2002

Bought a house and adopted a dog, 2004

James Daniel Nurmi born June 25, 2005

Received Ph.D. Nov. 2005

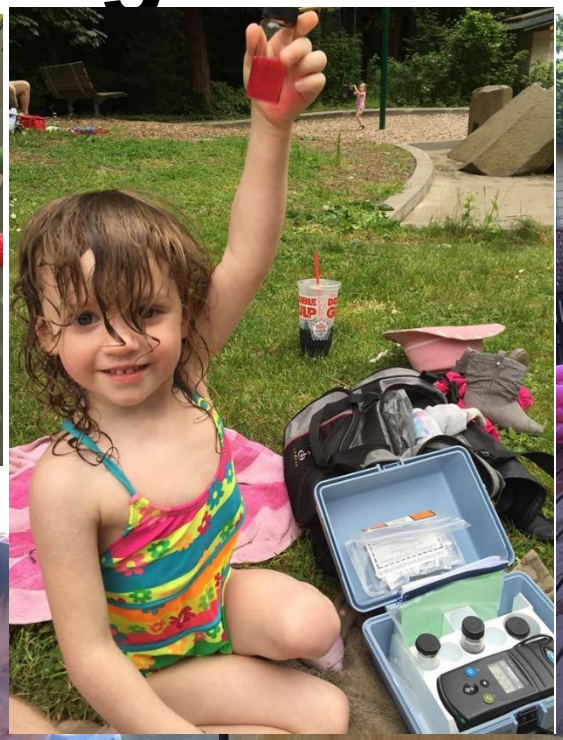
Anna Carmela Nurmi born March 7th, 2008

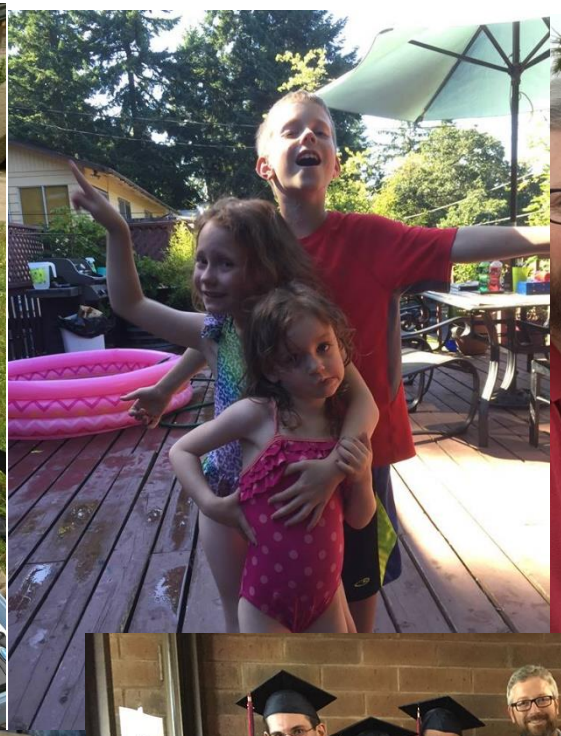
2011 Faculty at OHSU

Esmee Joan Nurmi born July 19th, 2011

2011 Faculty at CCC

Personal Background: Jim Nurmi





Personal Backgrounds

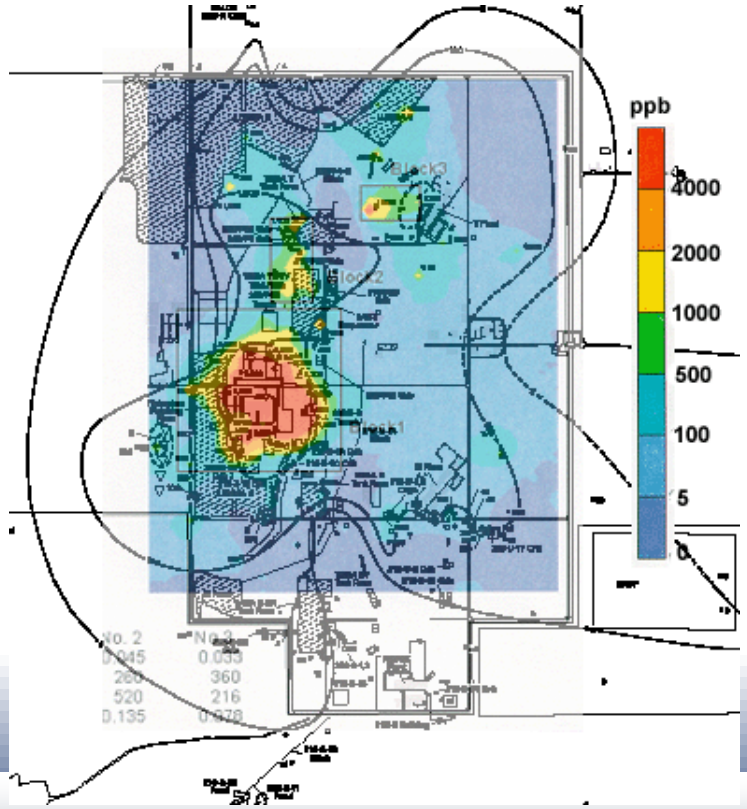
What I did at OHSU and What is the problem?

Superfund Sites

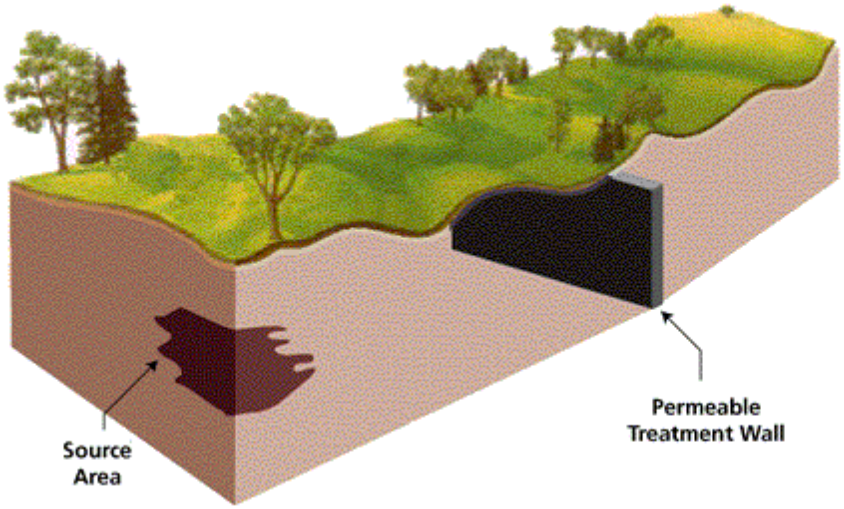
- US, contaminated groundwater = 1735 locations
- Oregon = 122 locations

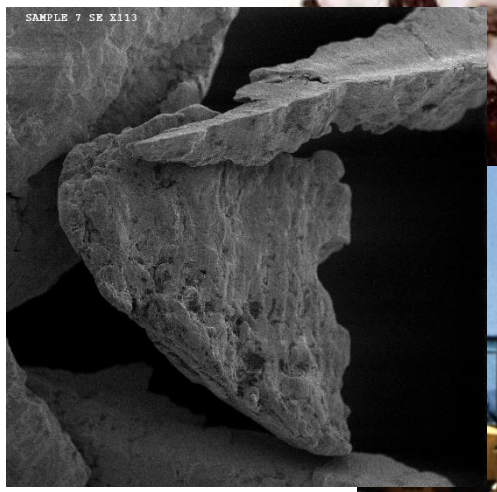
200 W Area of Hanford

- 750,000 kg spilled
- Vadose and GW zones
- 11 km^2 plume
- up to 7000 ug/L Cr



Reactive Treatment Zones





Working Together for Water

https://www.youtube.com/watch?v=IXBCrJ7uCkk

Oregon Cross Connection Control OARS 333-061-0071-74

Specialist- 4 day class OAR333-061-0073

- *A minimum of 30 hours of training; OAR 333-061-0074*
- (A) Definitions, identification of cross connection hazards, and the hydraulics of backflow;
- (B) Approved cross connection control methods, backflow prevention assembly specifications, and testing methods used for Authority-approved backflow prevention assemblies;
- (C) Cross connection control requirements for public water systems, implementation of a cross connection control program, and writing a local cross connection control ordinance;
- (D) Public education and record keeping requirements for an effective cross connection control program;
- (E) Facility water use inspection techniques and hands on inspection of local facilities to identify actual or potential cross connections;
- (F) Cross connection control program enforcement and managing a Backflow Assembly Tester program; and
- (G) Review and discussion of Cross Connection Specialist safety issues.
- 70% on final exam

Specialist Program Requirements OAR333-061-0074

Oregon Cross Connection Control OARS 333-061-0071-74

Specialist Renewal Requirements OAR333-061-0074

- A minimum of 0.6 CEU of training;
- (b) The course content shall contain, but is not limited to, the following topics:
- (A) Review of cross connection control regulations OAR 333-061-0070 through 0073;
- (B) Review and discussion of recent backflow incidents and identification of cross connections; and
- (C) Review and discussion of Cross Connection Specialist safety issues.

Oregon Cross Connection Control Regulations OARS 333-061-0070-73

Specialist Control Requirements OAR333-061-0070-0073

- (A) Review of cross connection control regulations OAR 333-061-0070 through 0073;
- **333-061-0070 Cross Connection Control Requirements**
- **333-061-0071 Backflow Prevention Assembly Installation and Operation Standards**
- **333-061-0072 Backflow Assembly Tester Certification**
- **333-061-0073 Cross Connection Specialist Certification**
- (B) Review and discussion of recent backflow incidents and identification of cross connections; and
- (C) Review and discussion of Cross Connection Specialist safety issues.

Cross Connection Control

Sections

1. History of Cross Connection Control
2. Working Together for Safe Water (video)
3. Real World Examples of Problems/Incidents
4. Hydraulics
5. Backflow Preventers
6. Facilities and their Cross Connections
7. Elements of a Program
8. Real World Examples of Problems/Incidents
9. Court Cases = CYA
10. Residential Plumbing Issues
11. Safety
12. What’s new in Cross Connection Control?

Definition of Cross-Connection

Definition of Cross-Connection

TCA 68-221-703. Definitions.

As used in this part, unless the context otherwise requires:

"Cross connection" means any physical arrangement whereby a public water supply is connected, directly or indirectly, with any other water supply system, sewer, drain, conduit, pool, storage reservoir, plumbing fixture or other device which contains, or may contain, contaminated water, sewage or other waste or liquid of unknown or unsafe quality which may be capable of imparting contamination to the public water supply as a result of backflow. Bypass arrangements, jumper connections, removable sections, swivel or change-over devices through which, or because of which, backflow could occur are considered to be cross-connections; [Acts 1983, ch. 324, § 4; 1988, ch. 583, § 2; T.C.A. § 68-13-703; Acts 1998, ch. 592, §§ 1-3.]

Who cares if there are cross connections?

Five categories we (water operators) are trying to protect our water from?

Water & Environmental Technology Program

An Overview of the Safe Drinking Water Act (SDWA)

Water & Environmental Technology
CLACKAMAS COMMUNITY COLLEGE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DRINKING WATER ACADEMY
DWA

Objectives

- **Explain threats to drinking water**

Drinking Water Standards and Public Health

“80% of all illness in the world is attributed to inadequate water or sanitation (Masters, 1991).”

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Drinking Water Standards and Public Health

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1993: 400,000 people became sick in Milwaukee Wisconsin (104 people died) * protozoan Cryptosporidium

Threats to Drinking Water

Contaminants and Health Effects

Discussion

- What contaminants pose a public health threat to your daily water?
- Do threats from public and private water supplies differ?
- What are the effects of these potential health threats?

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Contaminant Effects

Acute health effects

- within hours or days of the time that a person consumes a contaminant.

Chronic health effects

- consume a contaminant at levels over EPA's safety standards for many years

Aesthetic concerns

- Stinky water
- Cloudy water

Oregon Drinking Water Quality Act

- “To assure all Oregonians safe drinking water (1981).”
- “sufficiently free from biological, chemical, radiological, or physical impurities such that individuals will not be exposed to disease or harmful physiological effects (1981).”
- Oregon standards = national standards

What water needs treatment?

- **Source waters**:
  - "All lakes, rivers, reservoirs, *and some* source waters from aquifers need to be disinfected"
  - Basically any water that is exposed to the atmosphere at any point.

Oregon Drinking Water Quality Act

Oregon Health Authority (OHA)

- Broad authority to set drinking water standards
- Requires regular water sampling by suppliers
- Samples analyzed in state approved laboratories
- Any problems and they will investigate

Drinking Water Standards

Primary Drinking Water Standards

“Specify maximum contaminant levels MCL’s based on health based criteria for public water systems”

Secondary Drinking Water Standards

“Aesthetic qualities relating to the public acceptance of drinking water”

Types of Drinking Water Contaminants

Five categories of 91 contaminants in US drinking water:

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Types of Drinking Water Contaminants

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- **Organic Chemicals (56)**

Types of Drinking Water Contaminants

Five categories of 91 contaminants in US drinking water:

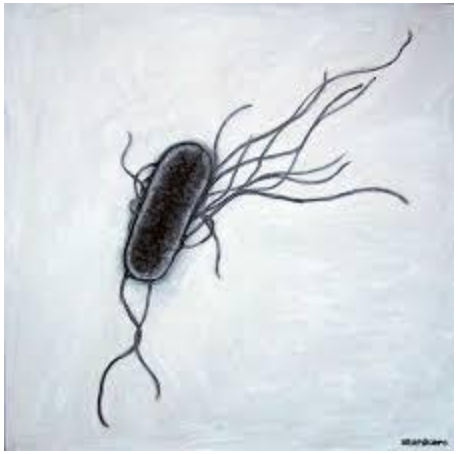
- **Microbial Contaminants (7) plus Turbidity**
- **Disinfectants and Disinfection By-Products (7)**
- **Inorganic Chemicals (16)**
- **Organic Chemicals (56)**
- **Radiologic Contaminants (5)**

Primary drinking water standards are enforceable by law but secondary are not?

1. True
2. False

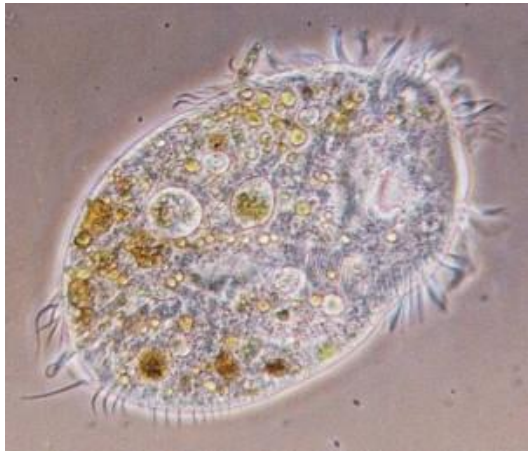
Microorganisms (including Turbidity)

Bacteria



E. Coli O157

Protozoa



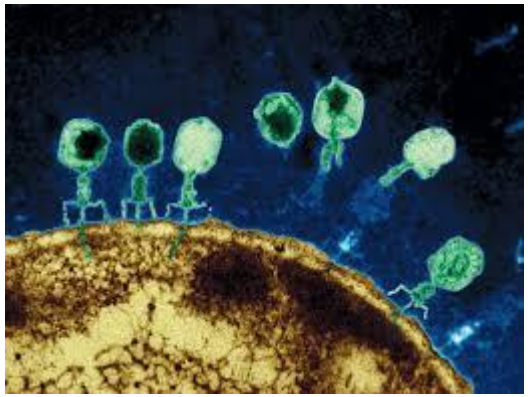
Giardia and Cryptosporidium

Metazoa

Rotifers

Microorganisms

Virus's



http://www.vox.com/2014/9/8/6122471/what-we-know-about-the-new-enterovirus-outbreak-virus

USA Primary Drinking Water Standards

Microbiological Species

- Pathogenic organisms cause acute gastrointestinal disease in humans
- *Cryptosporidium (protozoa=human & animal fecal waste)*:
- Diarrhea, cramps, nausea, headaches, etc.
- Resistant to chlorine
- *Giardia Lamblia (protozoa=human & animal fecal waste)*:
- Diarrhea, cramps, nausea, headaches, etc.
- *Legionella (bacteria in warm water):*
- Diarrhea, cramps, nausea, headaches, etc.

USA Primary Drinking Water Standards

Organic Chemicals (104 violations in US 2003)

USA Primary Drinking Water Standards

Organic Chemicals (104 violations in US 2003)

- Synthetic Organic Chemicals (SOC) (26)
  *Man Made and Toxic
  (pesticides and industrial solvents)

- Volatile Organic Chemicals (VOC) (78)
  *Vaporize at Room Temperature
  (degreasing agents, paint thinner, petroleum)

Primary Drinking Water Standards

Inorganic Chemicals (2,635 violations in US 2003)

Primary Drinking Water Standards

Inorganic Chemicals (2,635 violations in US 2003)

- Nitrates (767), Lead & Copper (1,539), Arsenic (29), etc.
- Naturally Occurring or Human Made

Primary Drinking Water Standards

Radionuclides (634 violations in US 2003)

- Radioactive contamination of drinking water.
  *Natural and Man Made Sources
  *Radon, Uranium, etc.

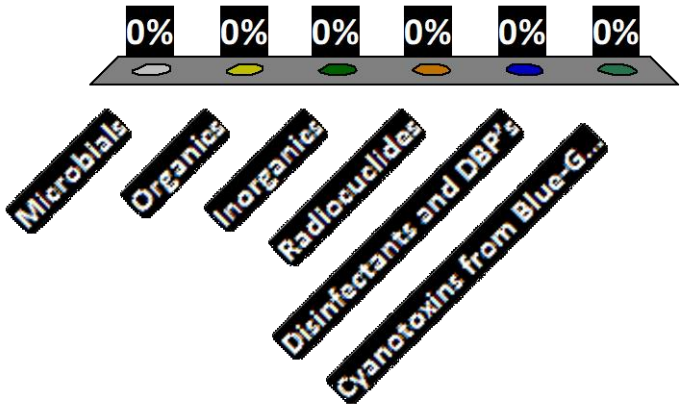
Primary Drinking Water Standards

Disinfectants and Disinfectant Byproducts (DBPs)

- Hypochlorite etc.
- Trihalomethane
- Haloacetic acid
- Others including Brominated compounds

Which of the following does NOT have a PRIMARY drinking water standard…yet!

A. Microbials
B. Organics
C. Inorganics
D. Radiocuclides
E. Disinfectants and DBP's
F. Cyanotoxins from Blue-Green Algae that is currently killing dogs in the South Willamette river and caused 400,000 people to lose their potable water in OH a few months ago and can only be tested for in two labs in the US, one in MI and one in FL and is the topic of a grant I am writing to try to get the equipment to test for these toxic organics……



Discussion

- Where do microbiological and chemical contaminants come from?
- In regards to Cross-Connection Control, where do most contaminants come from?

Degree of Hazard

Pollutants = Non-Health Hazard = Secondary MCL's

Contaminants = Health Hazard = Primary MCL's

Pollutant

- Non-Health Hazard: aesthetically objectionable (smells, tastes bad, looks bad) but does not hurt the consumer.

- Give some examples?

Contaminant

- Health Hazard: a substance that has either a acute or chronic effect on the consumers health
- Give Examples?
- How do we protect the community from these CONTAMINANTS?

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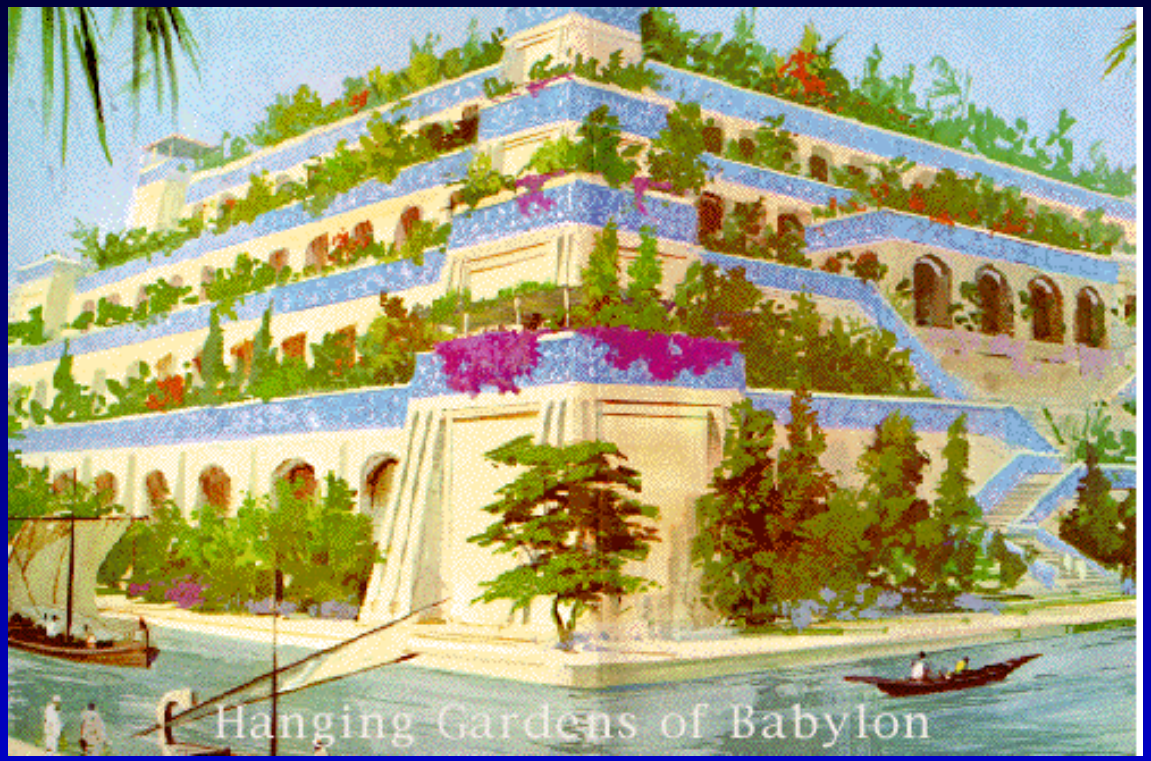
Section 1

History of X-Connection

History: Ancient Civilizations

- **Typically, civilizations started near water for drinking and irrigation**
  - **Clay jars were the earliest type of water distribution systems**
  - **Romans developed intricate network of aqueducts to carry water to their cities for drinking, bathing, fountains and finally to wash their waste away.**

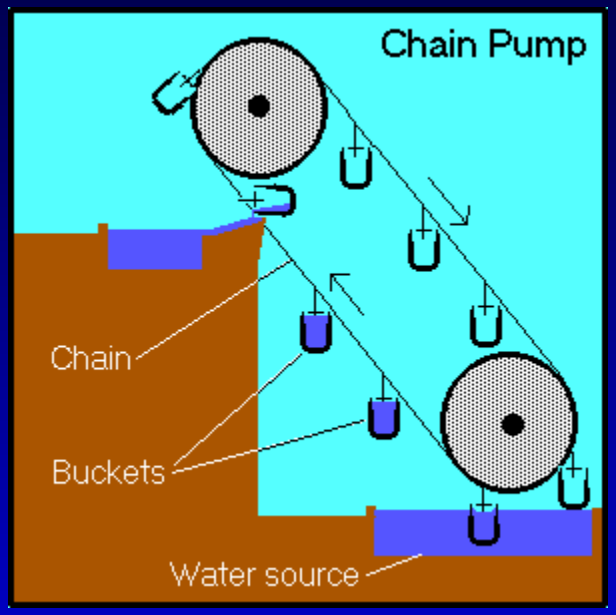
History: Ancient Civilizations



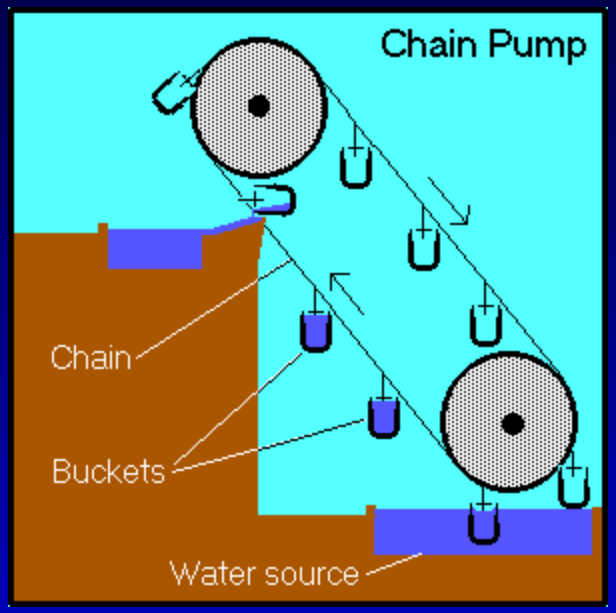
How did the Babylonians get water up to the garden?

History: Ancient Civilizations

Buckets brought water from the Euphrates…..HOW?

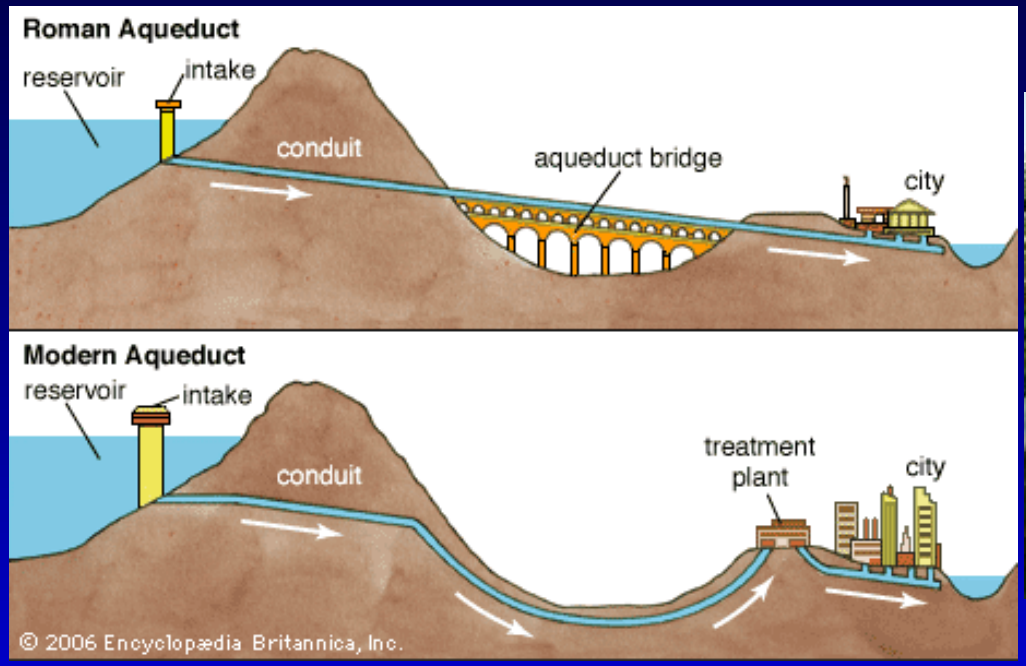


History: Ancient Civilizations



+ Slave Power

History: Ancient Civilizations



History: Ancient Civilizations

- The final destruction of Rome occurred in 537 AD during a siege on Rome by the Goths.
  - The aqueducts which supplied Rome with water were destroyed. The people of Rome could not survive without water and the population of Rome fell by 90% because of lack of water and disease.

- This is because they relied on aqueducts so much. Imagine if someone turned off all of your water in your house and said “SURVIVE”.
  - It would be impossible.
  - So when an Aqueduct was destroyed it was catastrophic.

History: Modern Age

- Most early water systems were developed primarily for fire suppression in industrial areas
- First developed municipal water utility was established in Boston, MA in 1652
- Pipes were hollowed out to transport water
- If you needed water, firefighters drilled a hole in the wood and plug them when done. Call a

History: Modern Age

- Earliest insurance companies insisted that water would be available either from the distribution system or directly from the river, so the distribution lines were directly linked to the river with only a single check or gate valve. Guess what happened?

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CROSS CONNECTION!!!!

- “Secondary Water Supplies, Their Danger and Values” published in 1910 New England AWWA subsection
    - The check valve consisted of an iron body with cast iron swing checks of clappers = metal to metal seating

History: Modern Age

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BACKFLOW INCIDENTS!!!!

- "Secondary Water Supplies, Their Danger and Values" published in 1910 New England AWWA subsection

  - The check valve consisted of an iron body with cast iron swing checks of clappers = metal to metal seating

  - RUST = limited BACKFLOW PROTECTION
  - Solution = multiple checks

History: Modern Age

First Check Valve designed in 1903

- Both checks (A and B) connected so that if one opens, both opens
- When there is flow, the Drain (C) closes
- Flow stops, checks close and drain (C) will open
- All of the components are linked together

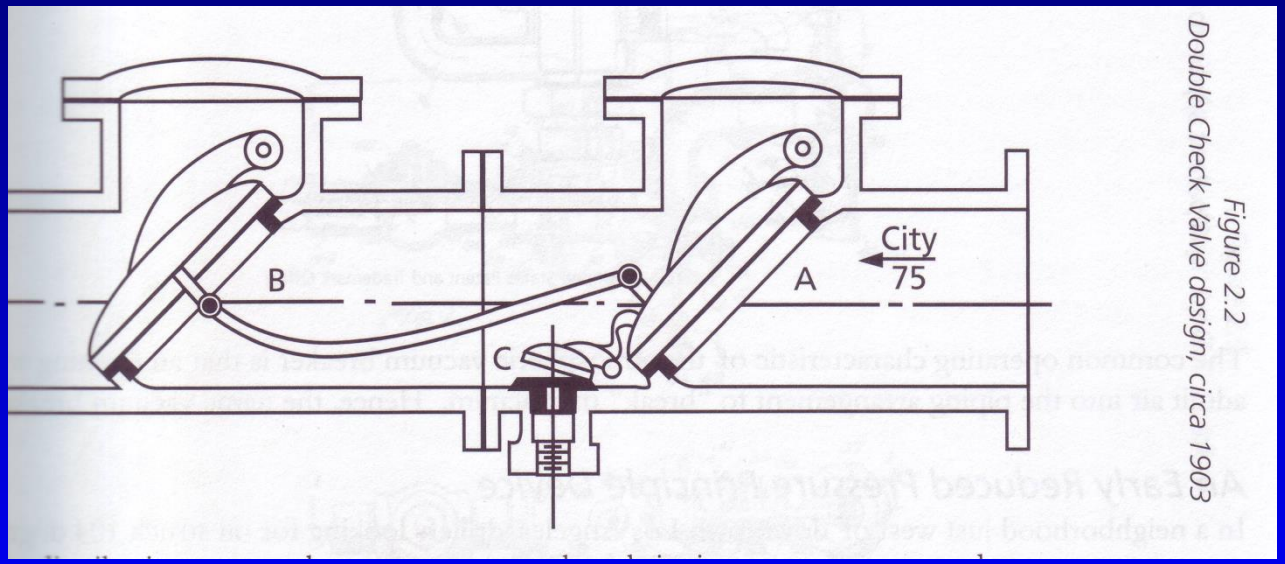


Figure 2.2
Double Check Valve design, circa 1903

Frank P. Cotter developed a "simple self sealing check valve, adapted to be connected in the pipe connections without requiring special fittings and which may be readily opened for inspection or repair" 1907 (U.S. patent #865,631).

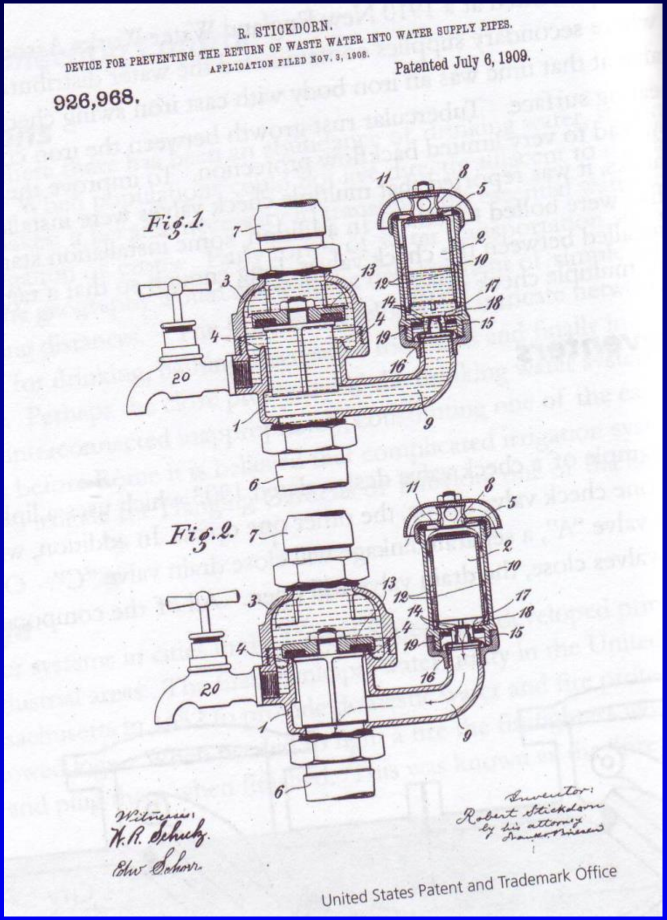
Nikola Tesla invented a deceptively simple one-way valve for fluids in 1916, called a Tesla valve. It was patented in 1920 (U.S. patent 1,329,559).

History: Modern Age

Vacuum Breakers

- 1909, first patent approved for “Device for Preventing The Return of Waste Water into Water Supply Pipes” = first atmospheric vacuum breaker

- Opening will admit air into the piping in order to break the vacuum



History: Modern Age

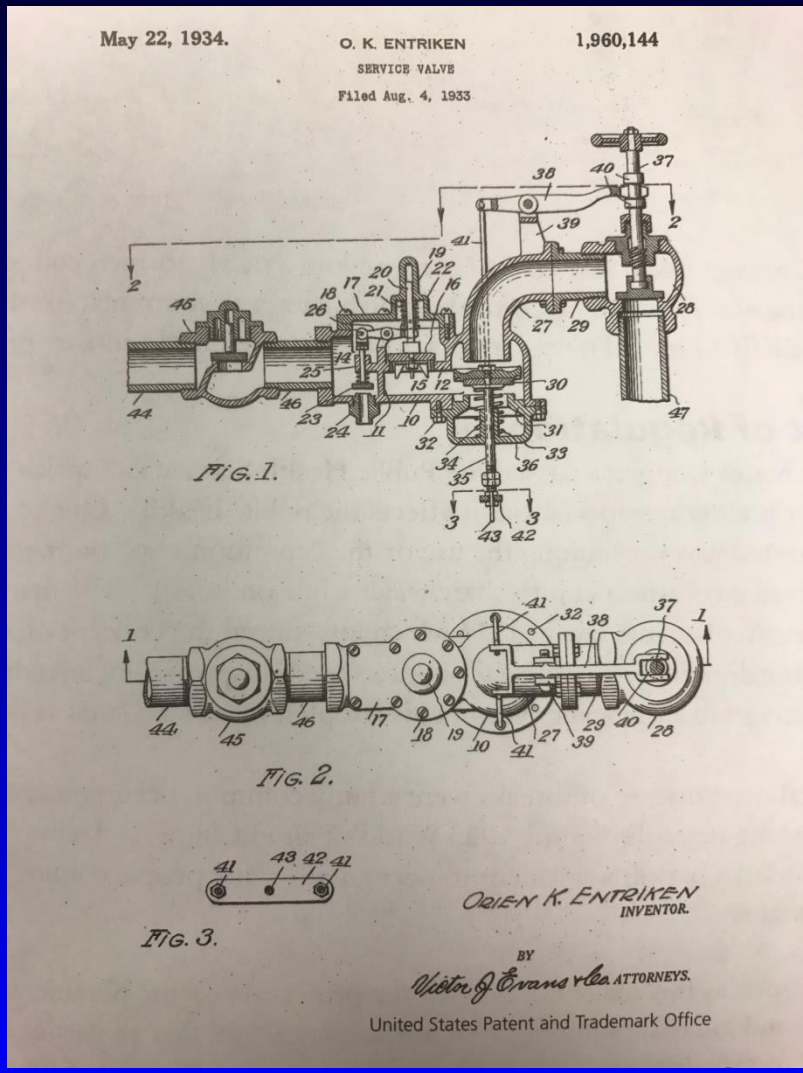
Early Reduced Principle Device

- West of LA, oil drillers hit 104ºC water
- **Bimini Baths** (also, **Bimini Hot Springs and Sanitarium**; currently **Bimini Slough Ecology Park**) was a geothermal mineral water public bathhouse and plunge in what is now Koreatown, Los Angeles, California, US. It was situated just west of downtown, near Third Street and Vermont Avenue. Bimini Baths contained a natatorium, swimming pools, swimming plunge, Turkish baths, a medical treatment department, and bottling works.

History: Modern Age

Early Reduced Pressure Principle Device

- **Bimini Baths** (also, **Bimini Hot Springs and Sanitarium**; currently **Bimini Slough Ecology Park**).
- The LA Dep. of Water and Power inspector told them they needed a double check valve.
- The chief engineer and owner of Bimini saw an opportunity and developed the first reduced pressure principle assembly.


May 22, 1934. O. K. ENTRIKEN 1,960,144

SERVICE VALVE

Filed Aug. 4, 1933

FIG. 1.

FIG. 2.

FIG. 3.

ORIEN K. ENTRIKEN INVENTOR.

BY Victor J. Evans & Co. ATTORNEYS.

United States Patent and Trademark Office

This is a picture of one of the first Check Valves?

A. True

B. False

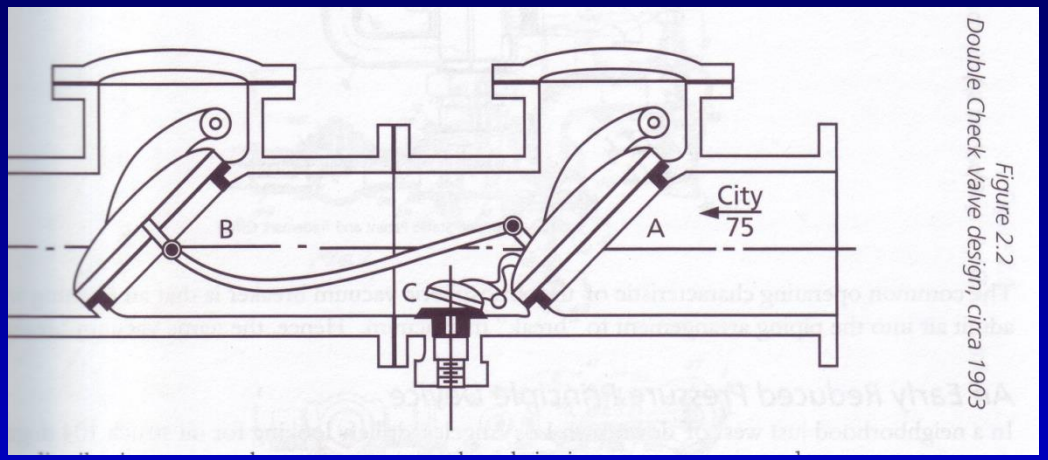
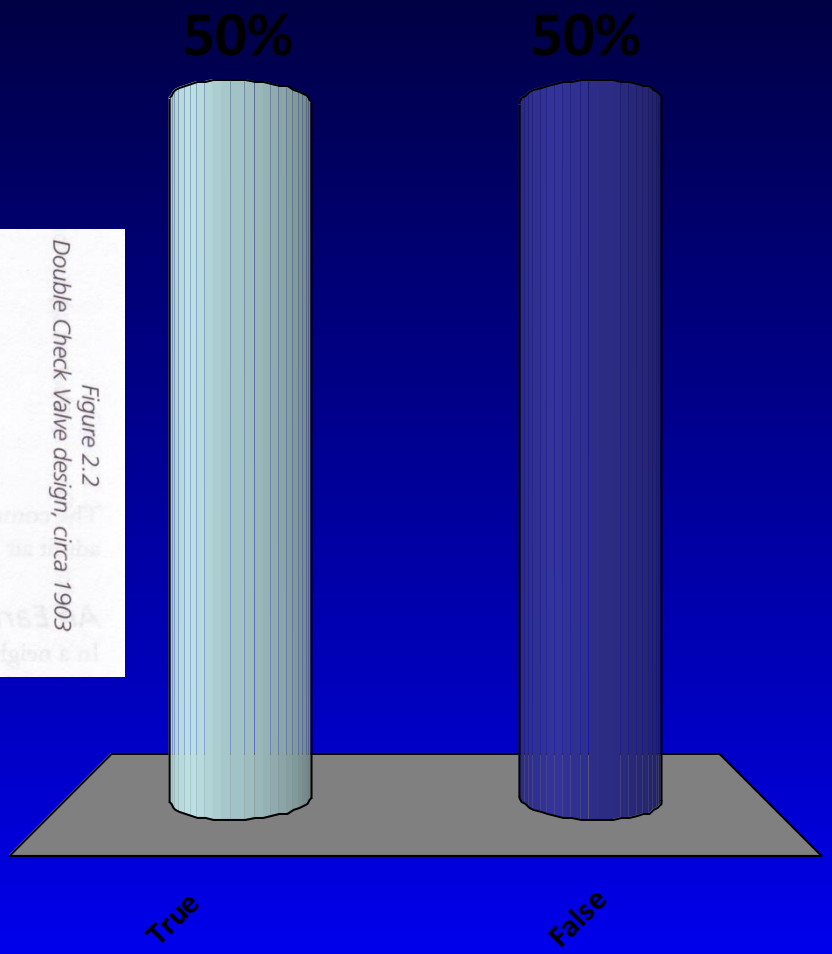


Figure 2.2
Double Check Valve design, circa 1903

Note how the checks and drain are physically connected.



The Unseen Hazard!

Cross Connections

https://www.youtube.com/watch?v=HLVt6GNxZho

Backflow Preventers

Backflow Assemblies

Backflow Preventer- means a device, assembly or method to prevent backflow into the potable water system.

Approved Backflow Prevention Assembly- means a Reduced Pressure Principle Backflow Prevention Assembly, Reduced Pressure Principle-Detector Backflow Prevention Assembly, Double Check Valve Backflow Prevention Assembly, Double Check-Detector Backflow Prevention Assembly, Pressure Vacuum Breaker Backsiphonage Prevention Assembly, or Spill-Resistant Pressure Vacuum Breaker Backsiphonage Prevention Assembly, of a make, model, orientation, and size approved by the Department.

Assemblies listed in the currently approved backflow prevention assemblies list developed by the University of Southern California, Foundation for Cross-Connection Control and Hydraulic Research

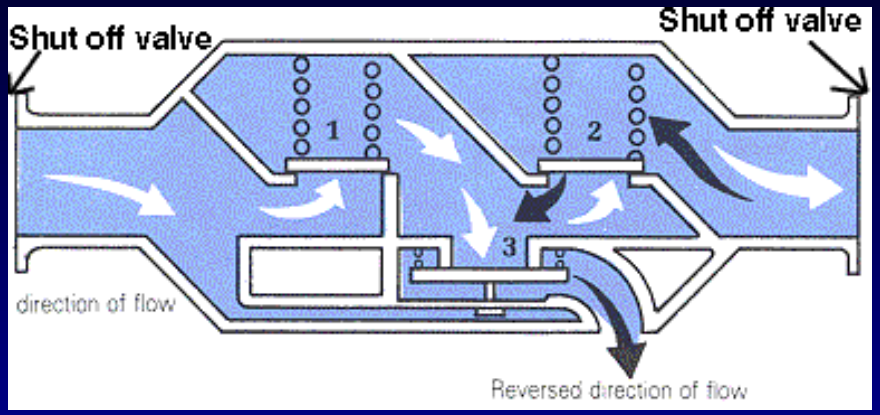
Five Means of Preventing Backflow

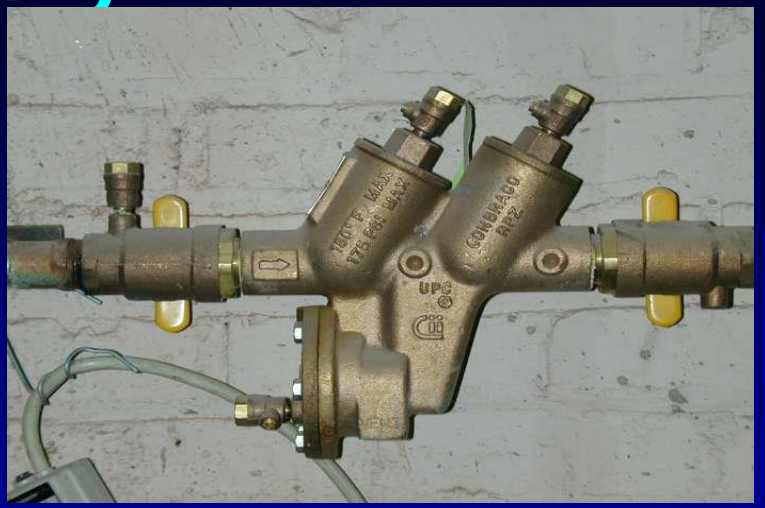
What are they?

Five Means of Preventing Backflow

- Air Gap Separation
- Reduced Pressure Principle Assembly
- Double Check Valve Assembly
- Pressure Vacuum Breaker/
  Spill-Resistant Vacuum Breaker
- Atmospheric Vacuum Breaker

Backflow prevention assemblies identification/installation/hydraulics

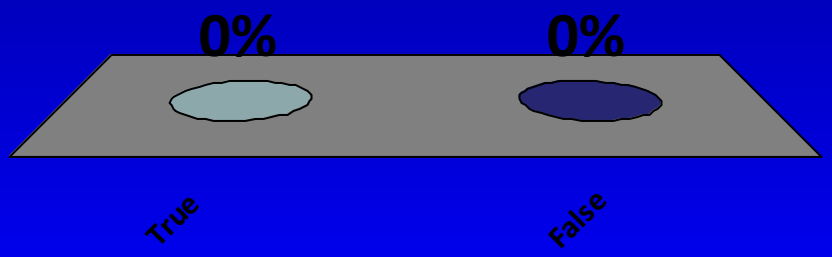




In a cross connection control plan the service connection is typically located at the property line or service meter of a home?

A. True

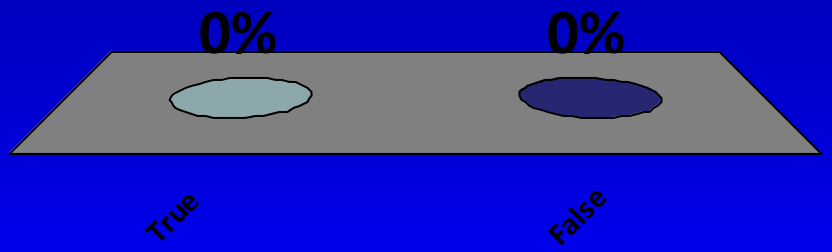
B. False



An Auxiliary Water Supply is any supply of water used to augment the supply obtained from the public water system, which serves the premise in question (groundwater well).

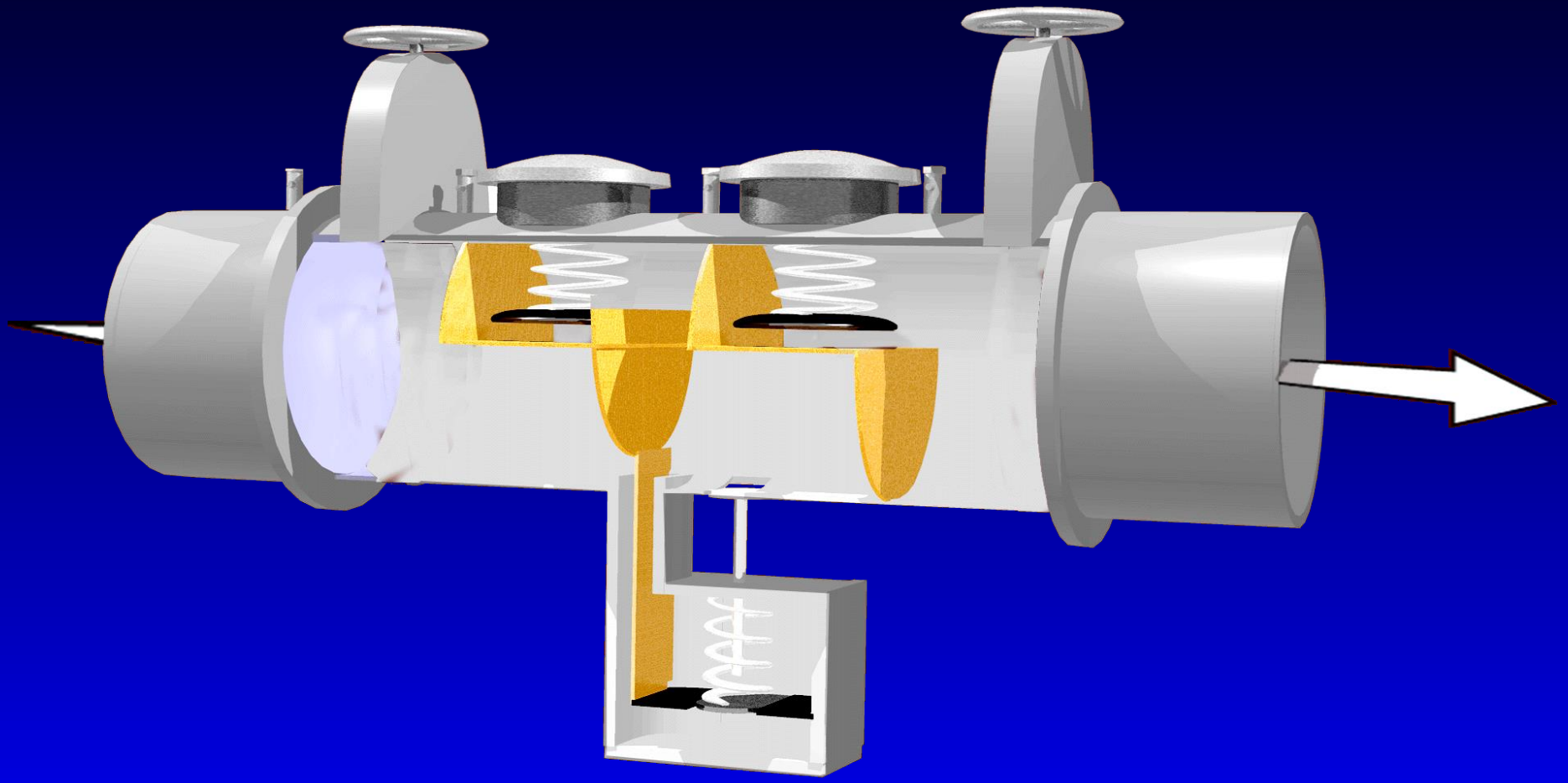
A. True

B. False



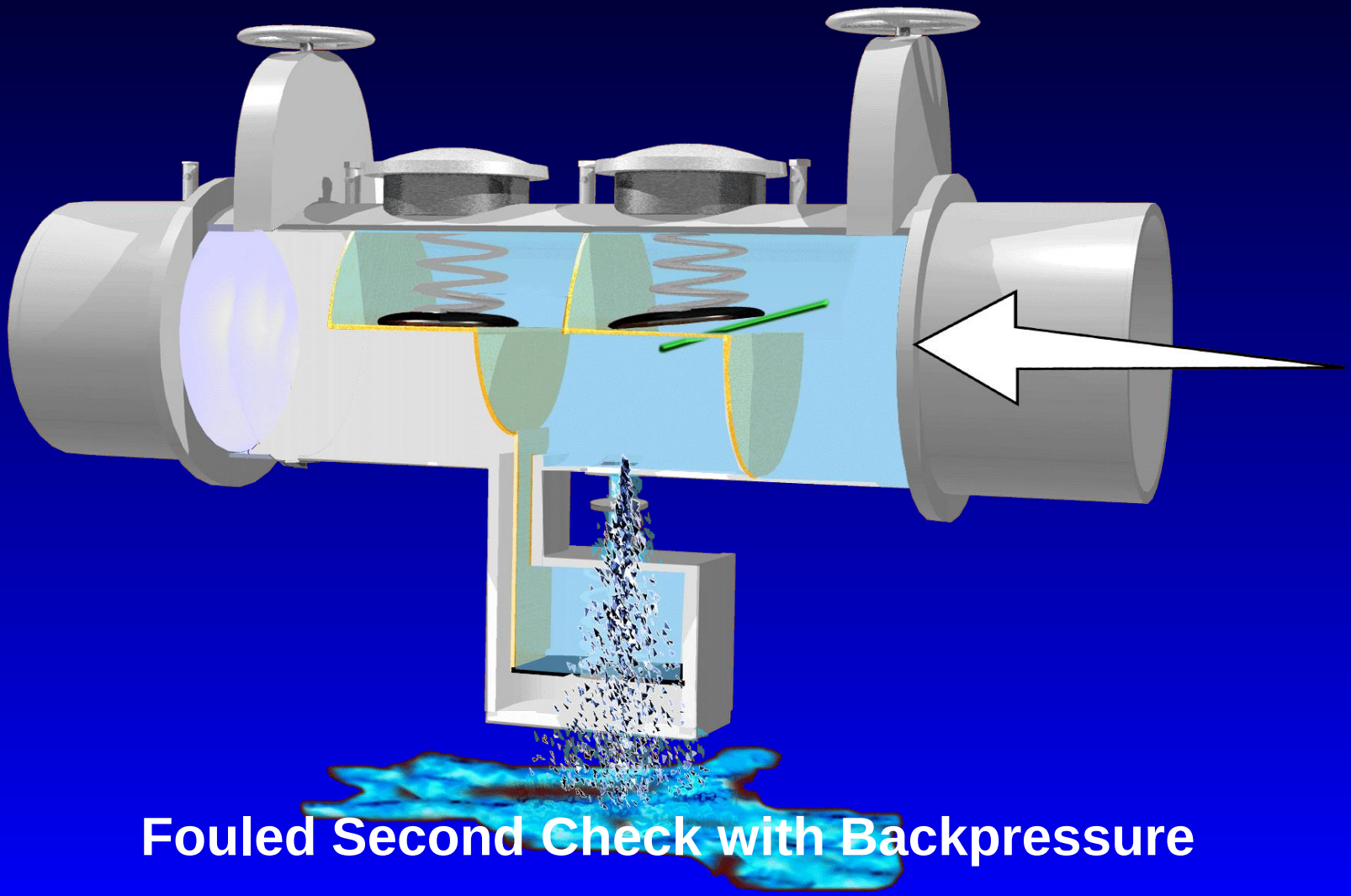

2x diameter
not less than 1"
Air Gap

Reduced Pressure Principle Assembly (RP)



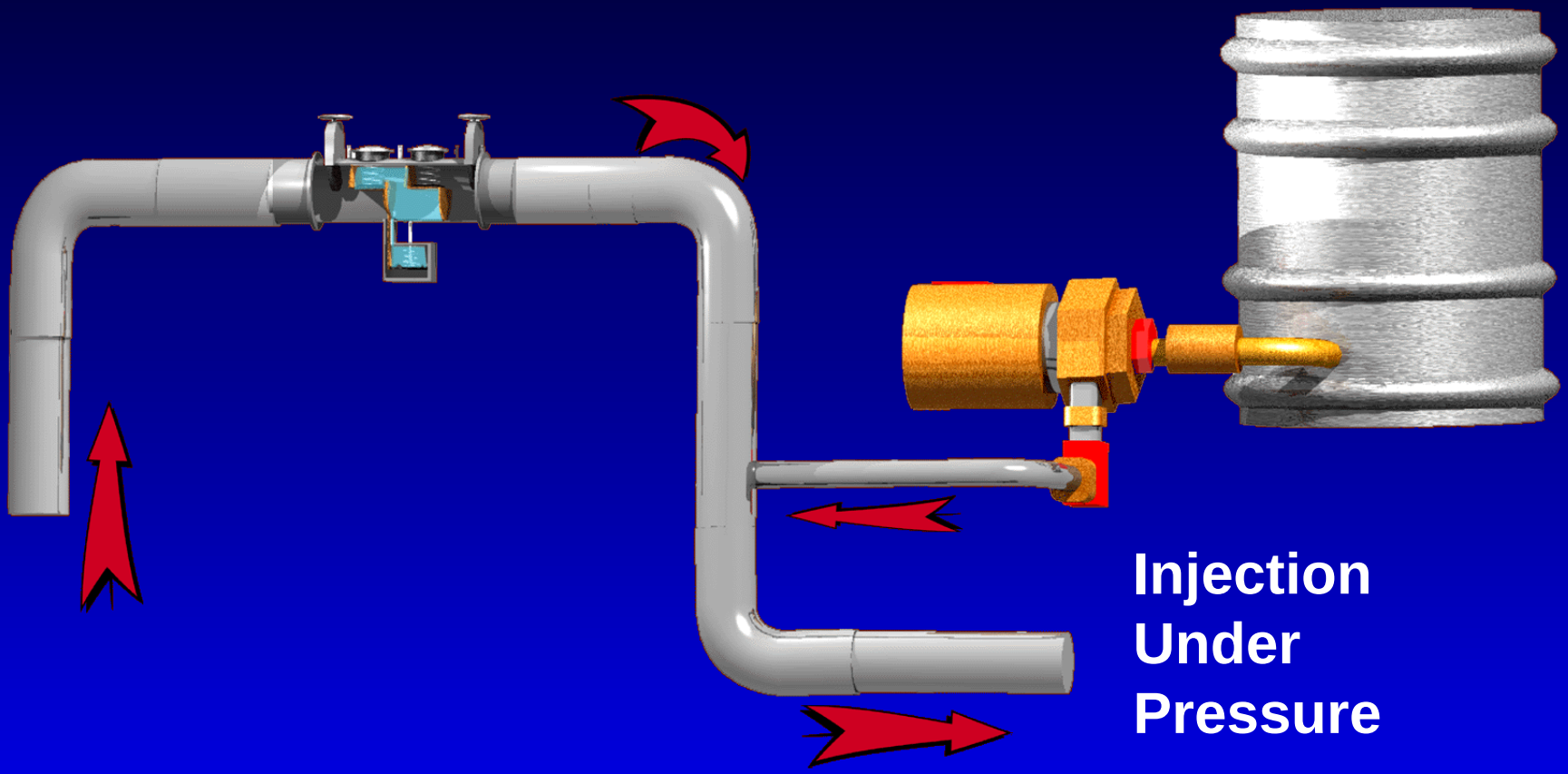
Normal Flow

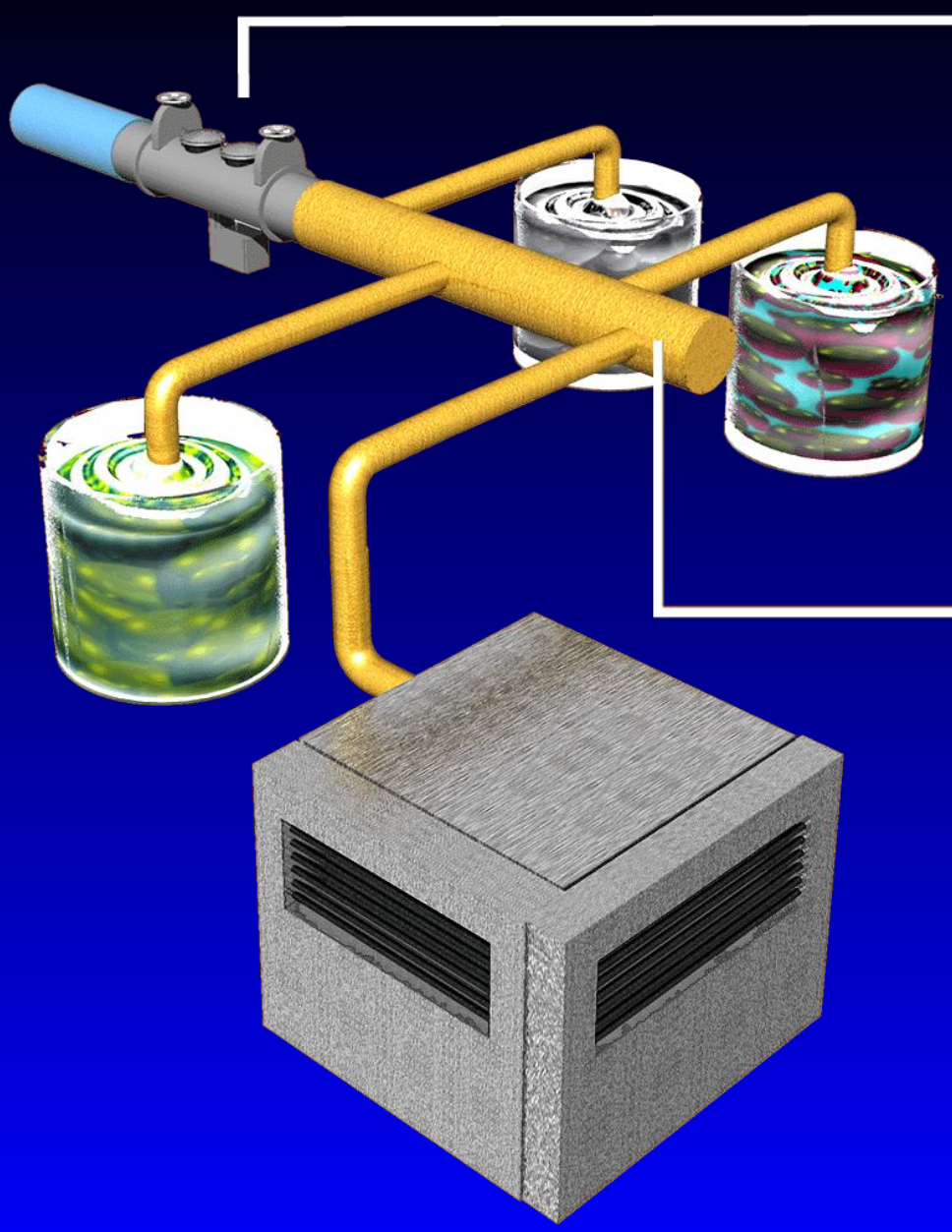
Reduced Pressure Principle Assembly (RP)



Fouled Second Check with Backpressure

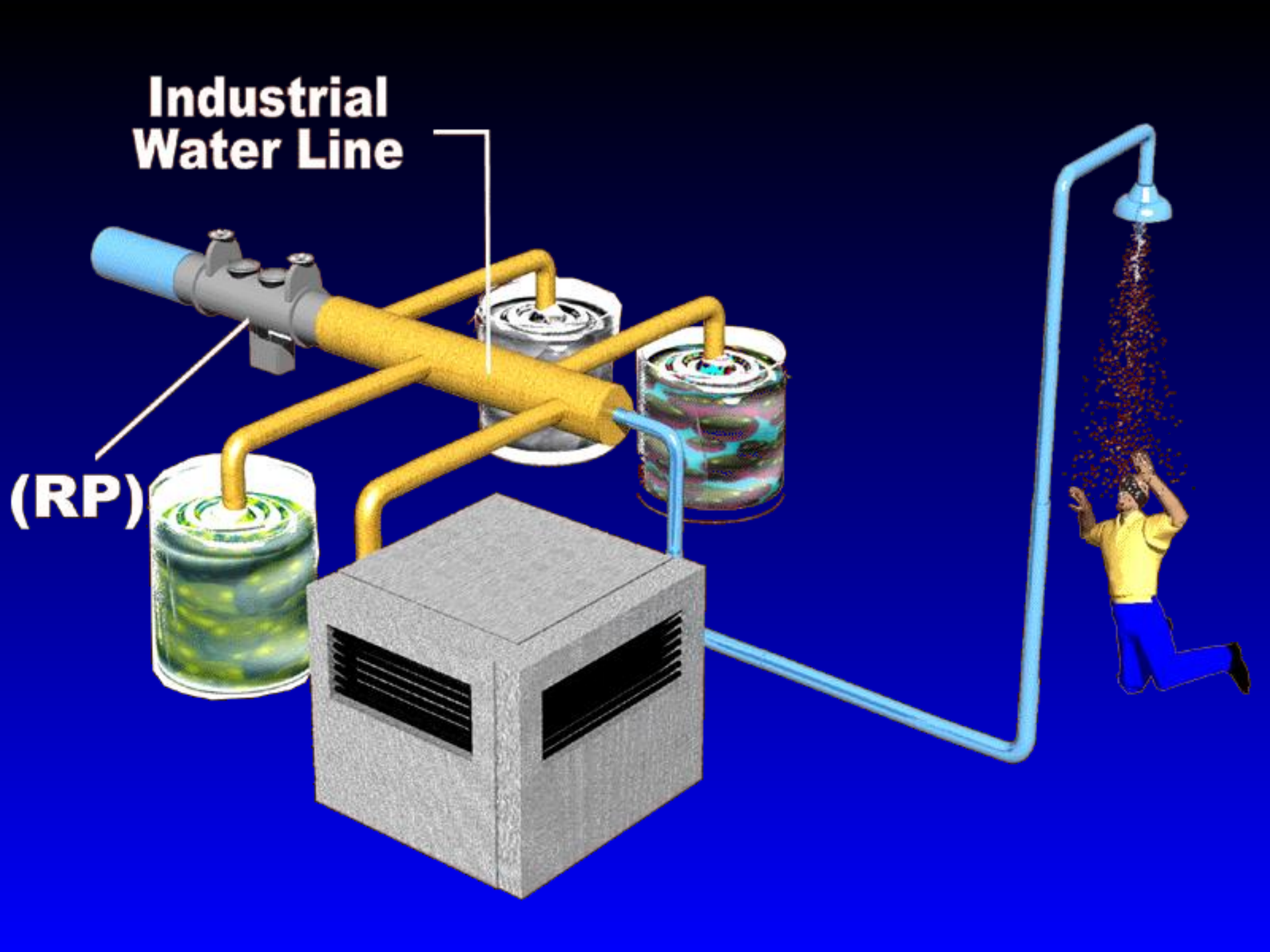
Reduced Pressure Principle Assembly (RP)

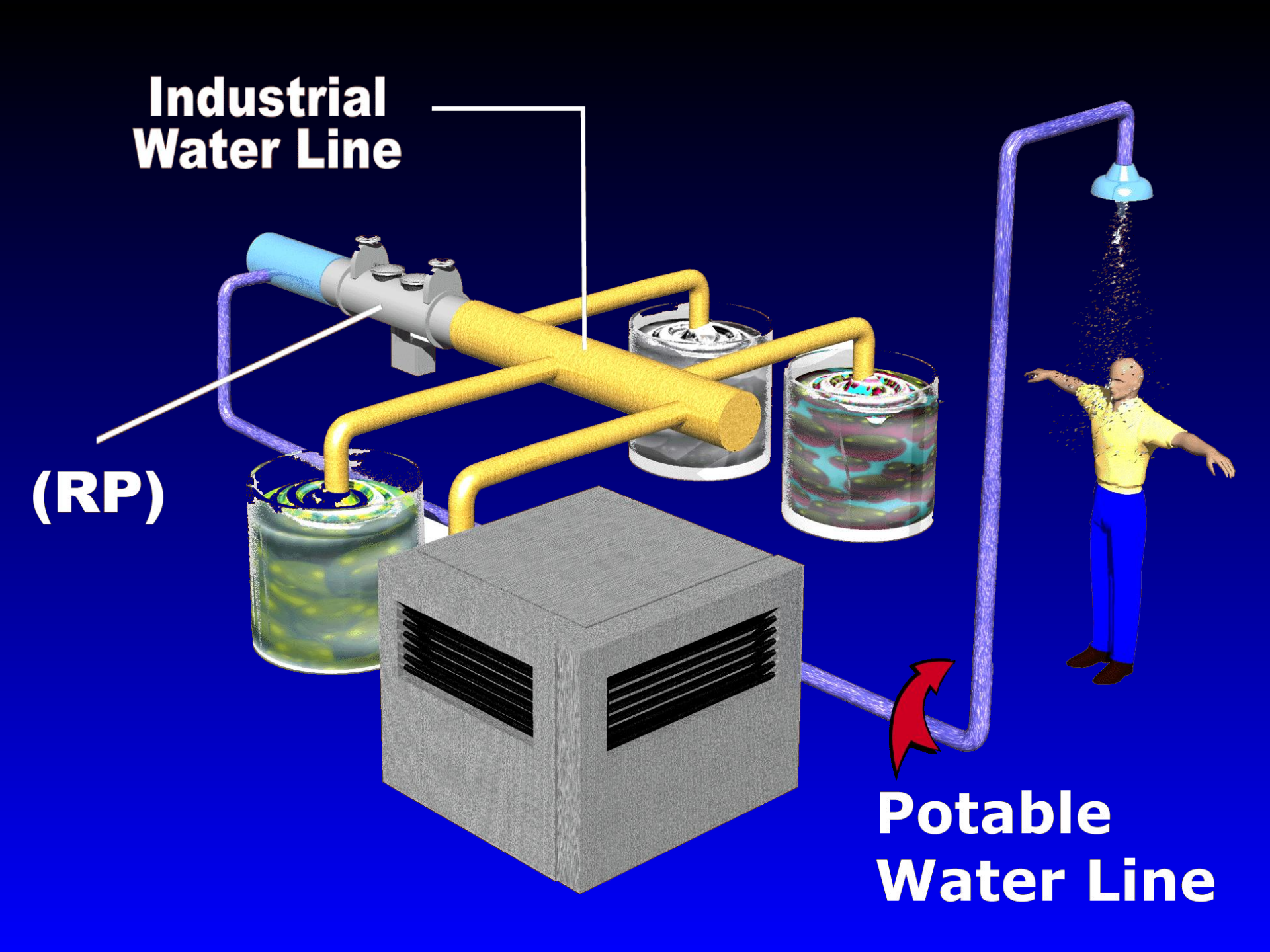




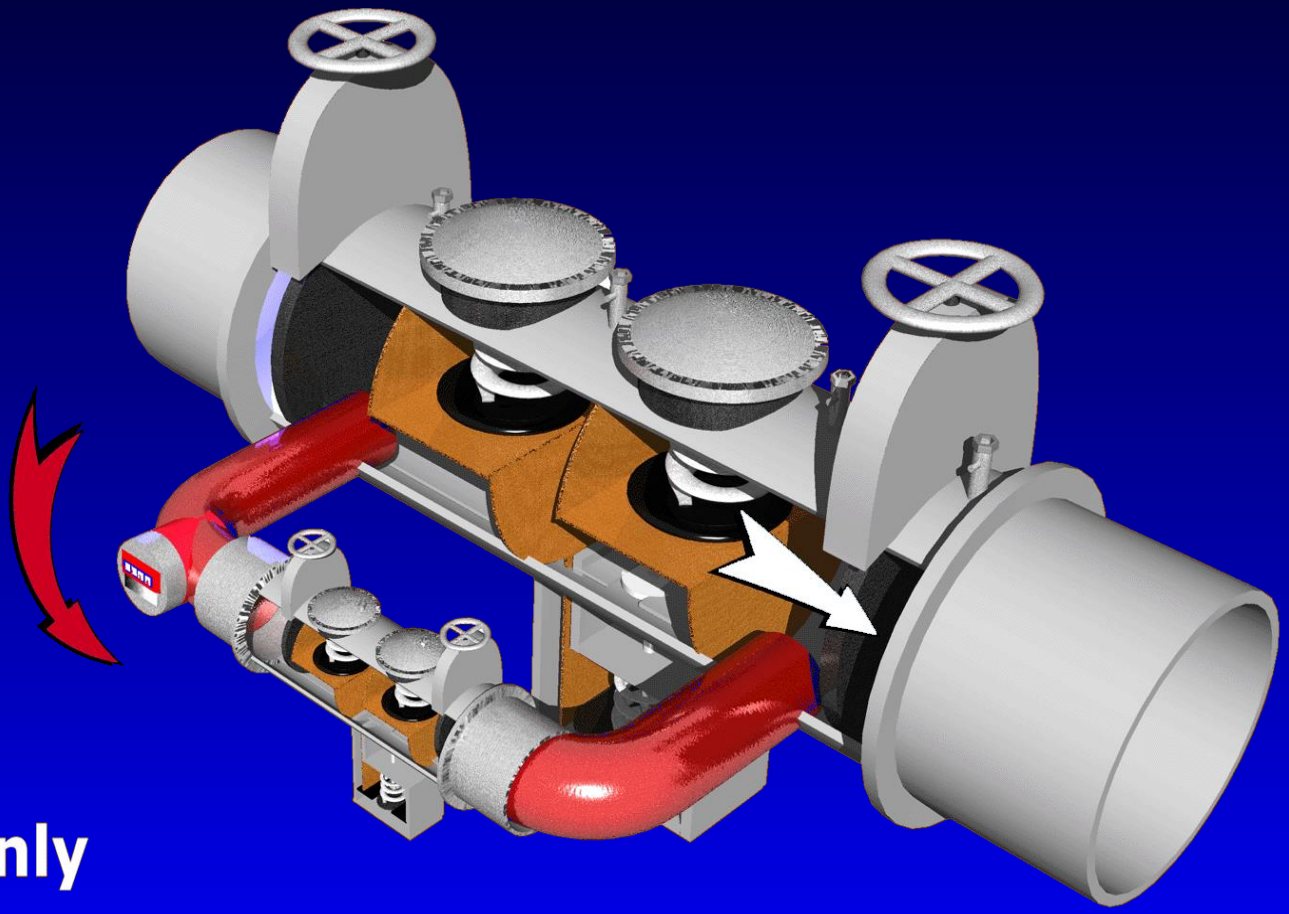
(RP)

Industrial
Water Line


Industrial
Water Line
(RP)


Industrial
Water Line
(RP)
Potable
Water Line

Reduced Pressure Principle Detector Assembly



At Least
3 GPM
Through
Bypass Only

Reduced Pressure Principle Assembly (RP)

What is it good for?

- Backsiphonage
- Backpressure
- Pollutant
- Contaminant

Installation Issues

- See Figure 1 OAR 333-061-0071
- Vertical installation only if approved
- Above 100 year flood
- Never extended or plugged relief valve
- Protected from freezing
- Provided approved air gap drain
- NOT installed in a vault or box UNLESS a bore-sighted drain to daylight is provided
- May be installed with less clearances if <= 2” pipes
- Not installed > 5’ unless OSHA approved permanent platform

Reduced Pressure Principle Assembly (RP)

What is it good for? **Installation Issues**

Shall not be installed in an enclosed vault or box unless a bore-sighted drain to daylight is provided where there is an **unrestricted straight-line opening in the enclosure that vents to grade**, and is sized and constructed to adequately drain the full flow discharge from the reduced pressure principle backflow prevention assembly thus preventing any potential for submersion of the assembly;

- **Not installed > 5’ unless OSHA approved permanent platform**

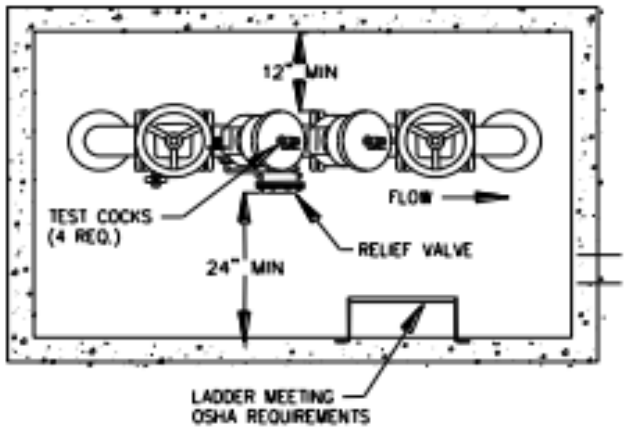
Reduced Pressure Principle Assembly (RP)

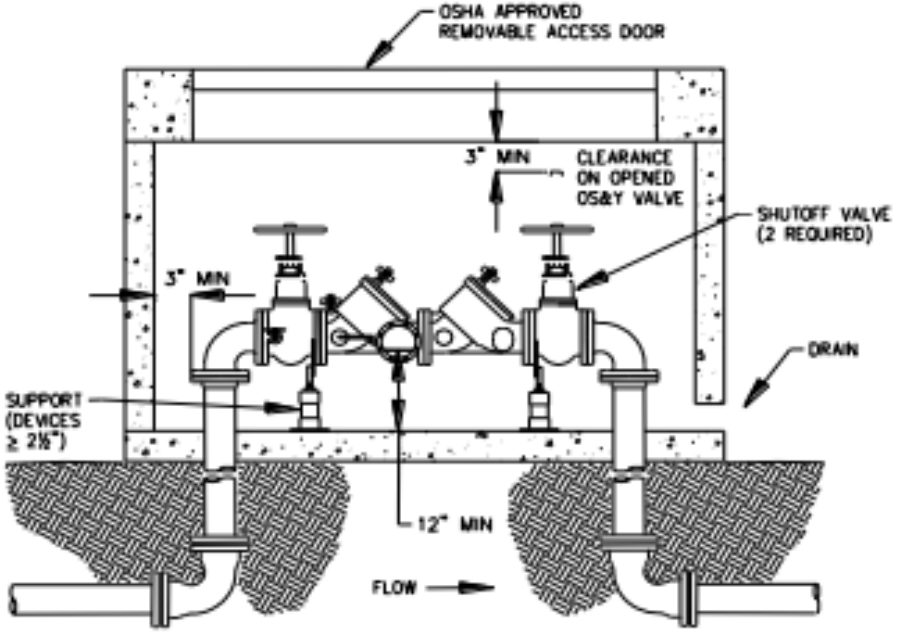
What is it good for?

Installation Issues

- See Figure 1 OAR 333-061-

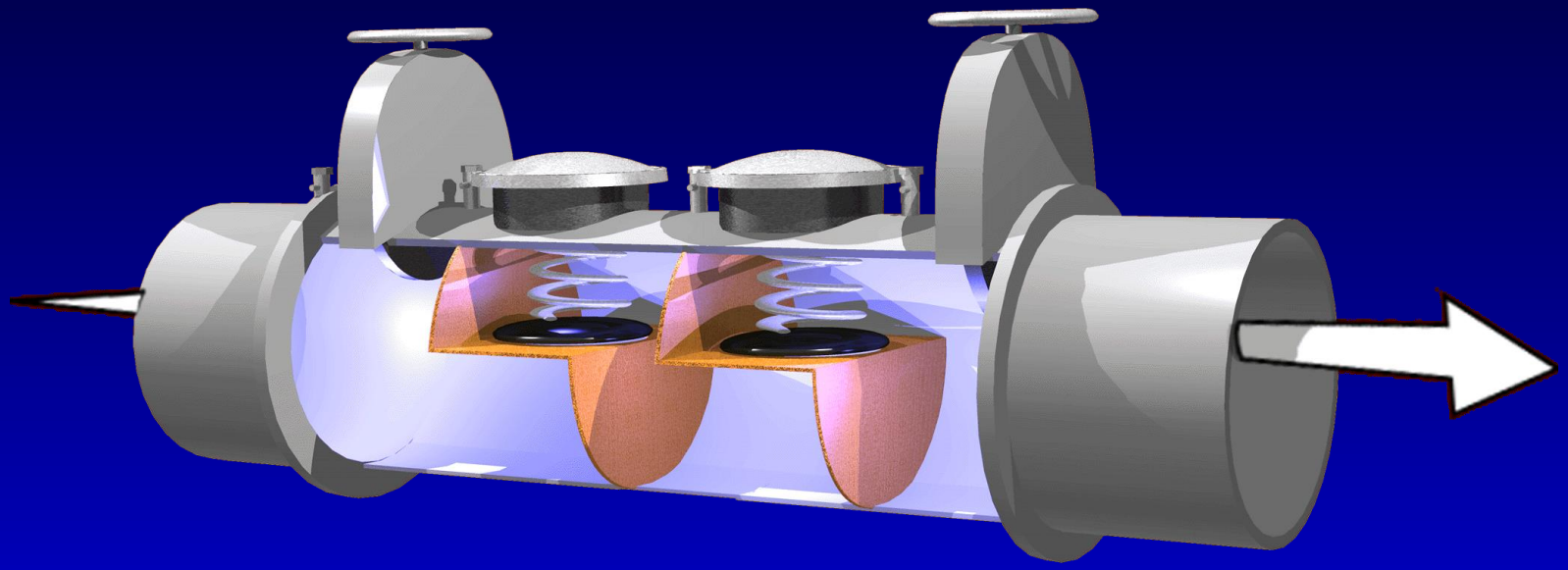
Figure 1





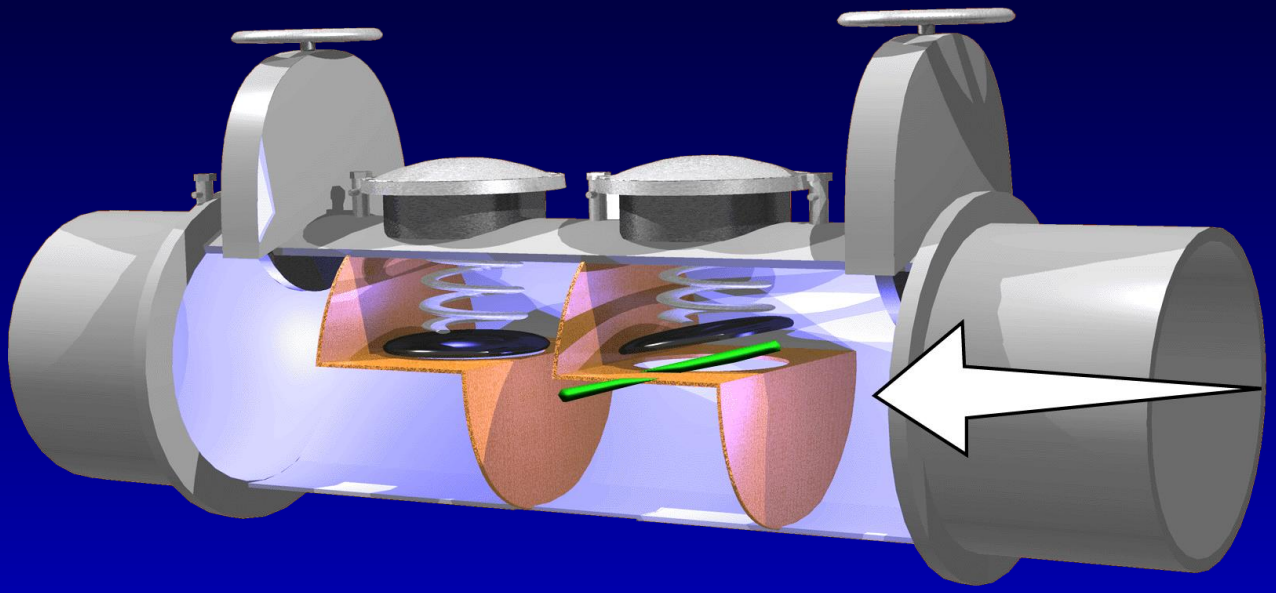
- Not installed > 5’ unless OSHA approved permanent platform

Double Check Valve Assembly (DC)



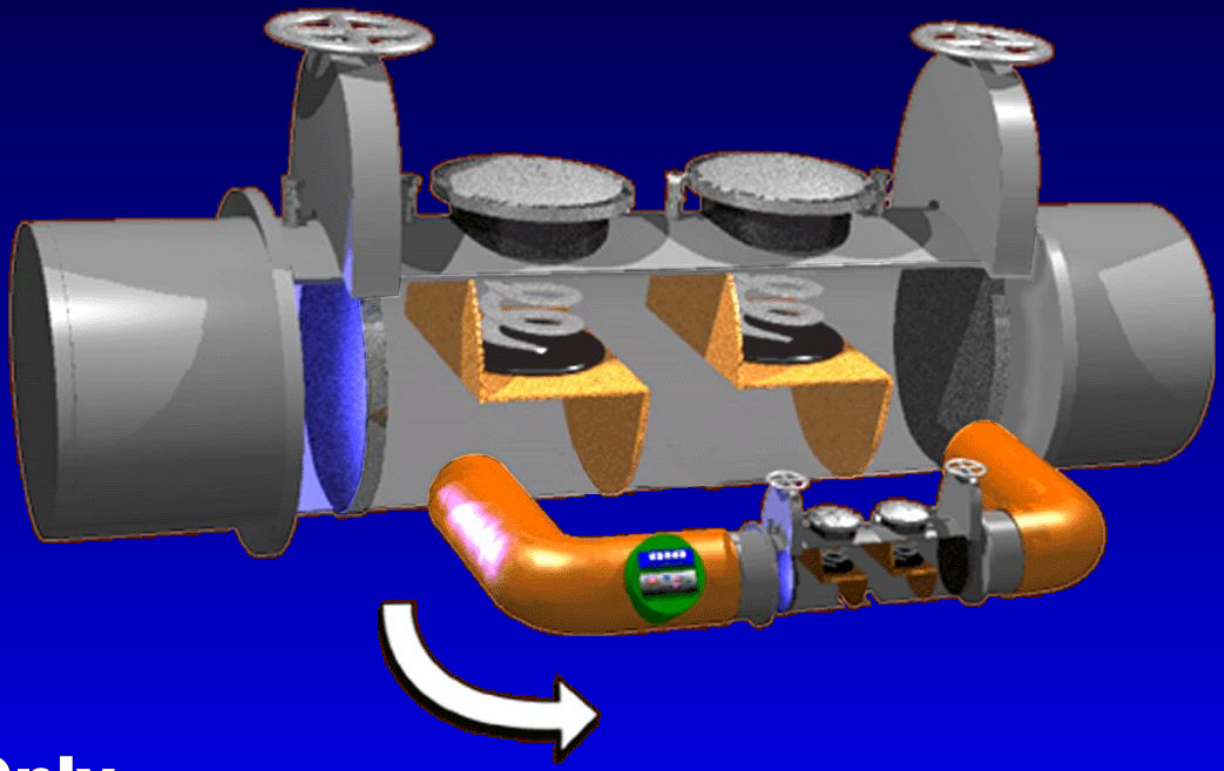
Normal Flow

Double Check Valve Assembly (DC)



Backpressure
Second Check Fouled

Double Check Detector Assembly



At least
3 GPM
Through
By Pass Only

Double Check (DC)

What is it good for?

- Backsiphonage
- Backpressure
- Non-Health hazard/Pollutant

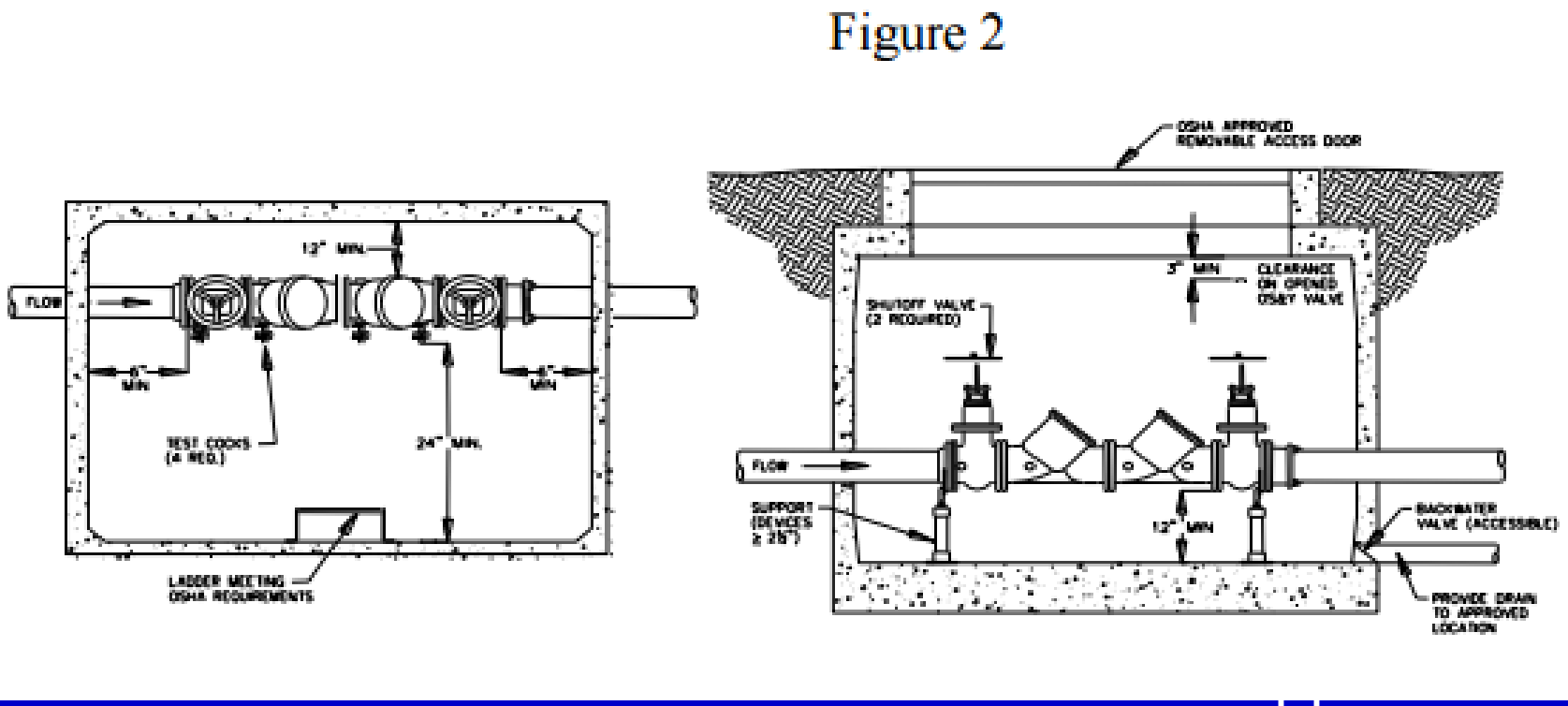
Installation Issues

- See Figure 2 OAR 333-061-0071
- Vertical and horizontal installation if listed as H and V
- May be installed below grade in a vault provided water-tight test cock plugs or caps
- Shall not be subject to continuous immersion
- Needs adequate drainage but not connected to sanitary or storm drain
- May be installed with less clearances if <= 2” pipes
- Not installed > 5’ unless OSHA approved permanent platform
- Protected from freezing

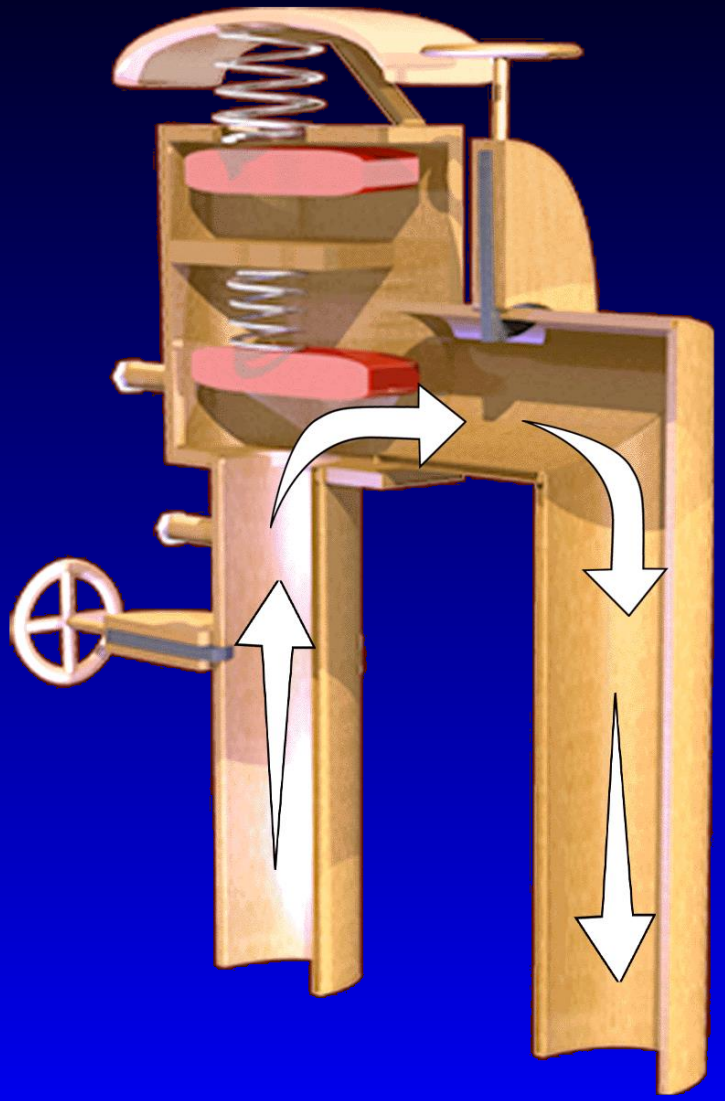
Double Check (DC)

What is it good for?

Installation Issues

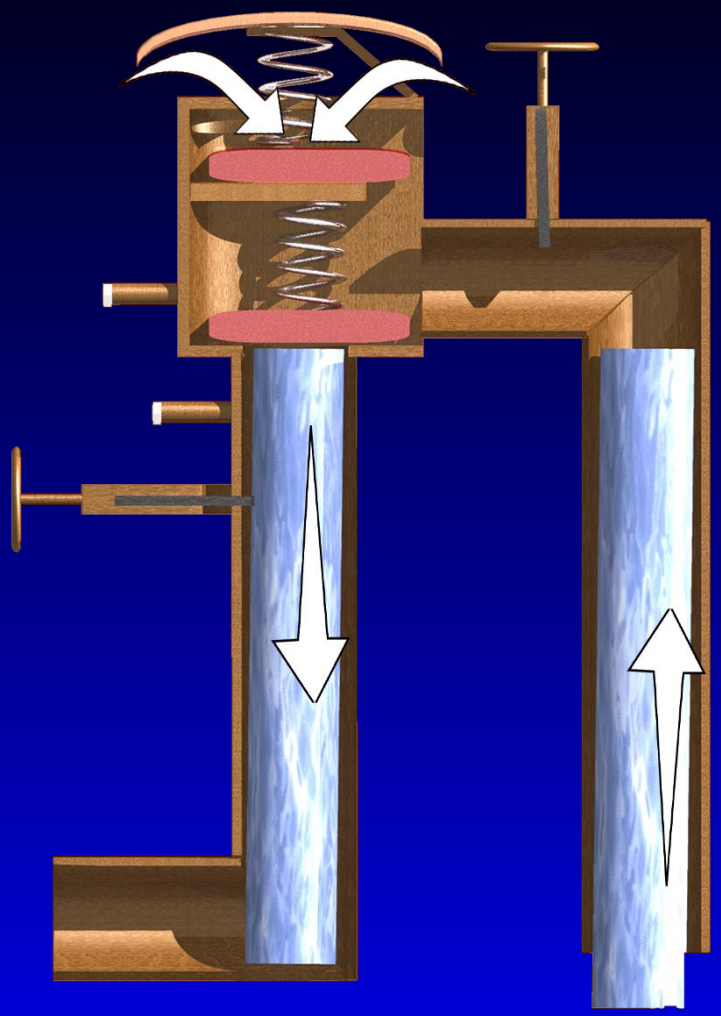


- **Not installed > 5’ unless OSHA approved permanent platform**
- **Protected from freezing**



Pressure Vacuum Breaker (PVB)

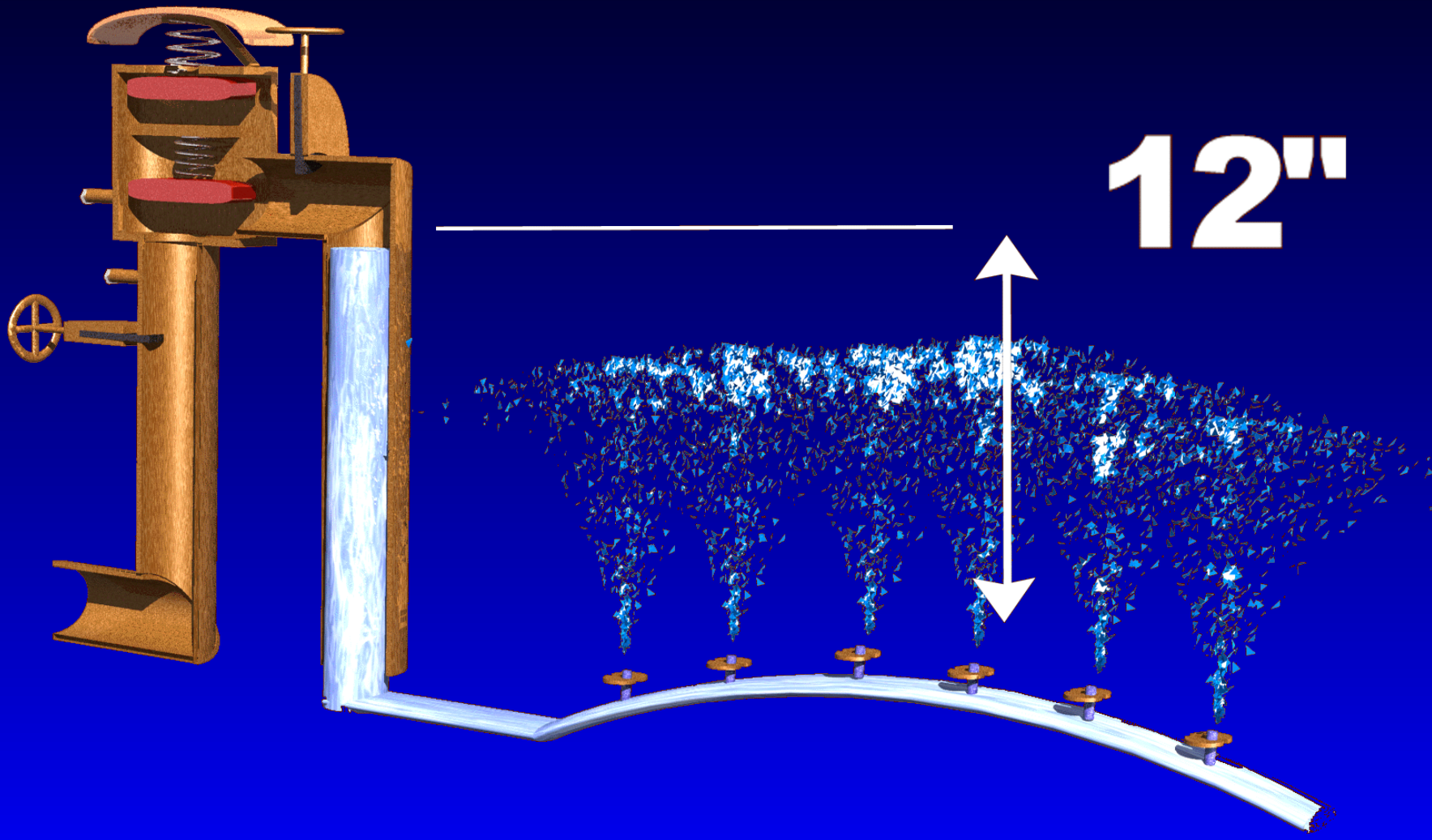
Normal Flow



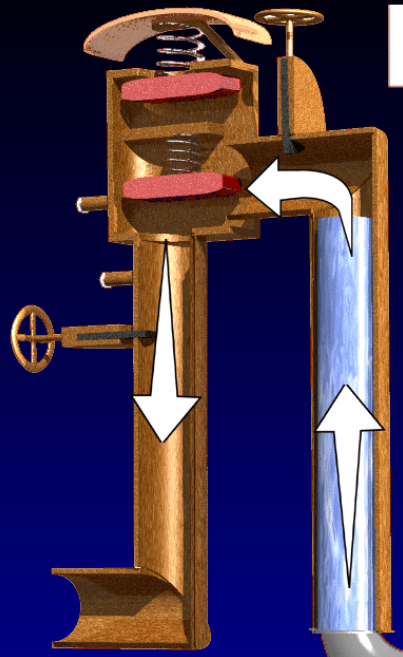
Pressure Vacuum Breaker (PVB)

Backsiphonage Condition

Pressure Vacuum Breaker

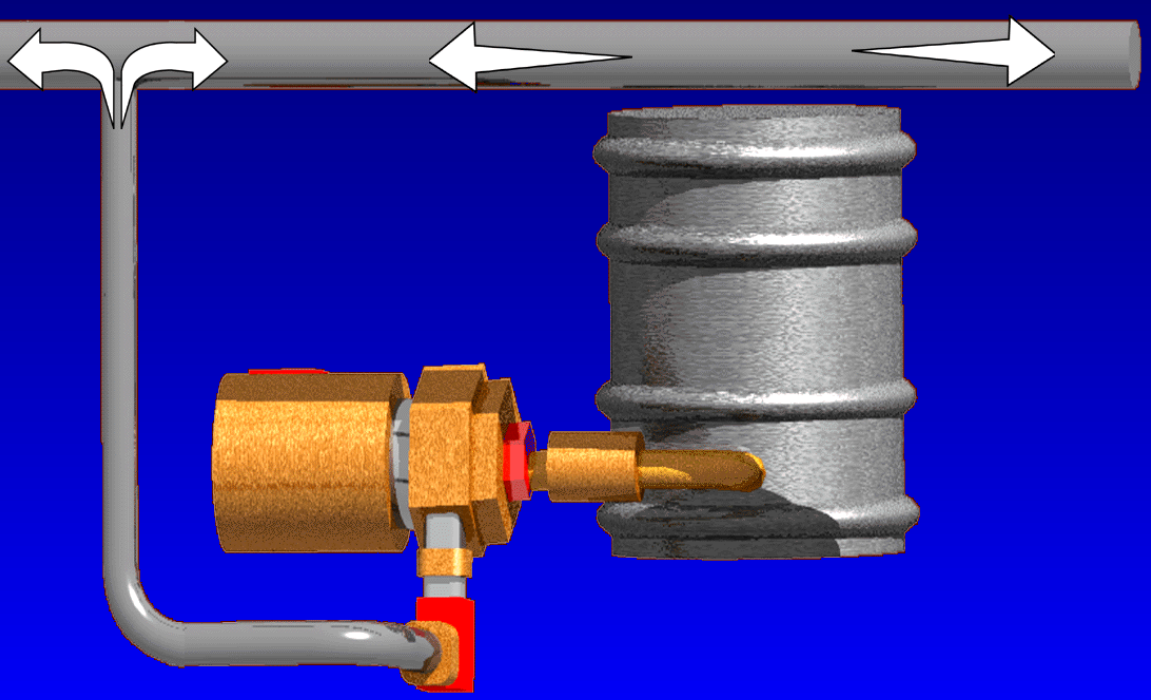


Pressure Vacuum Breaker

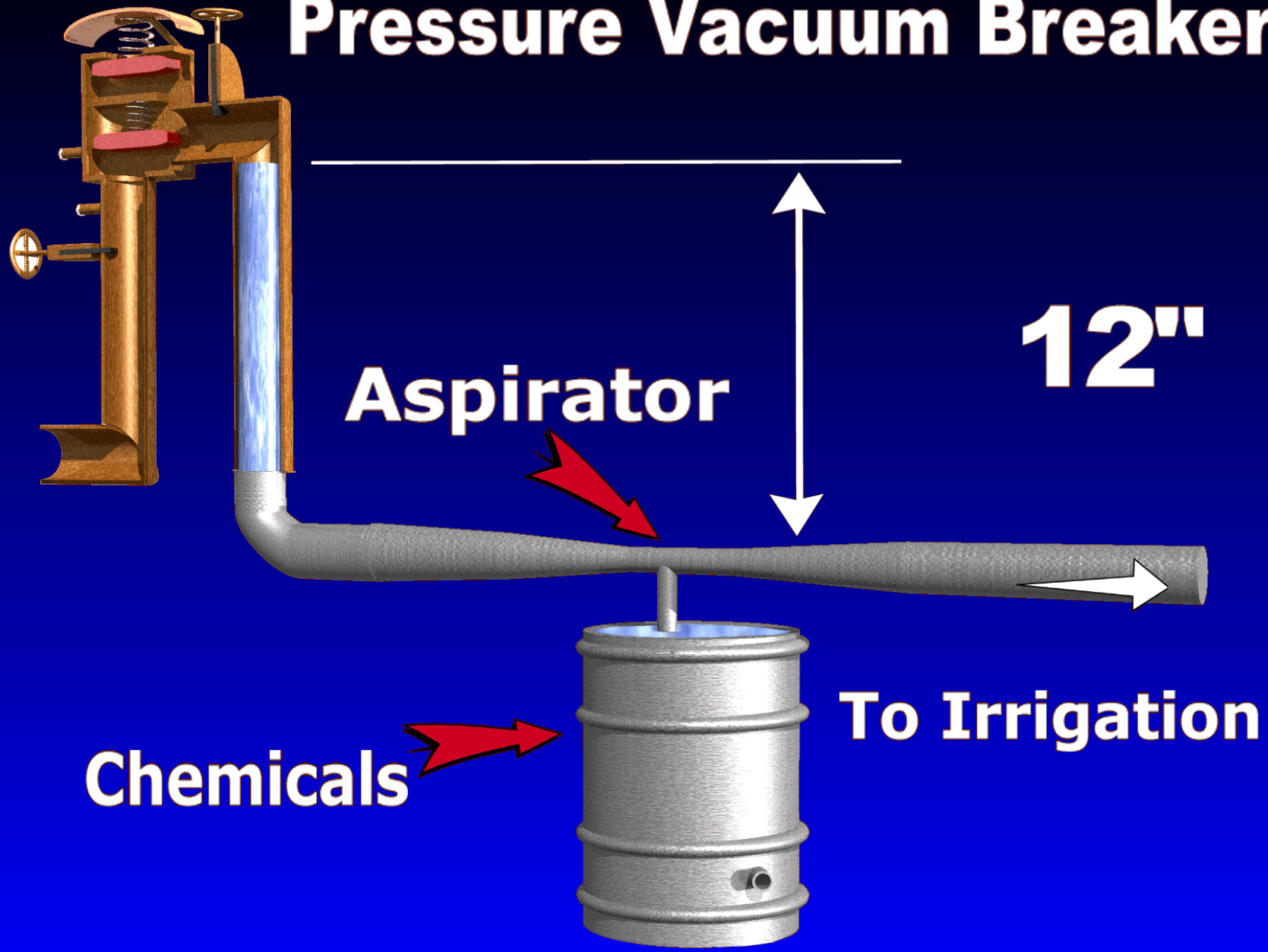


Improper Installation
Subject to Backpressure

To Irrigation



Pressure Vacuum Breaker



PVB or SVB

What is it good for?

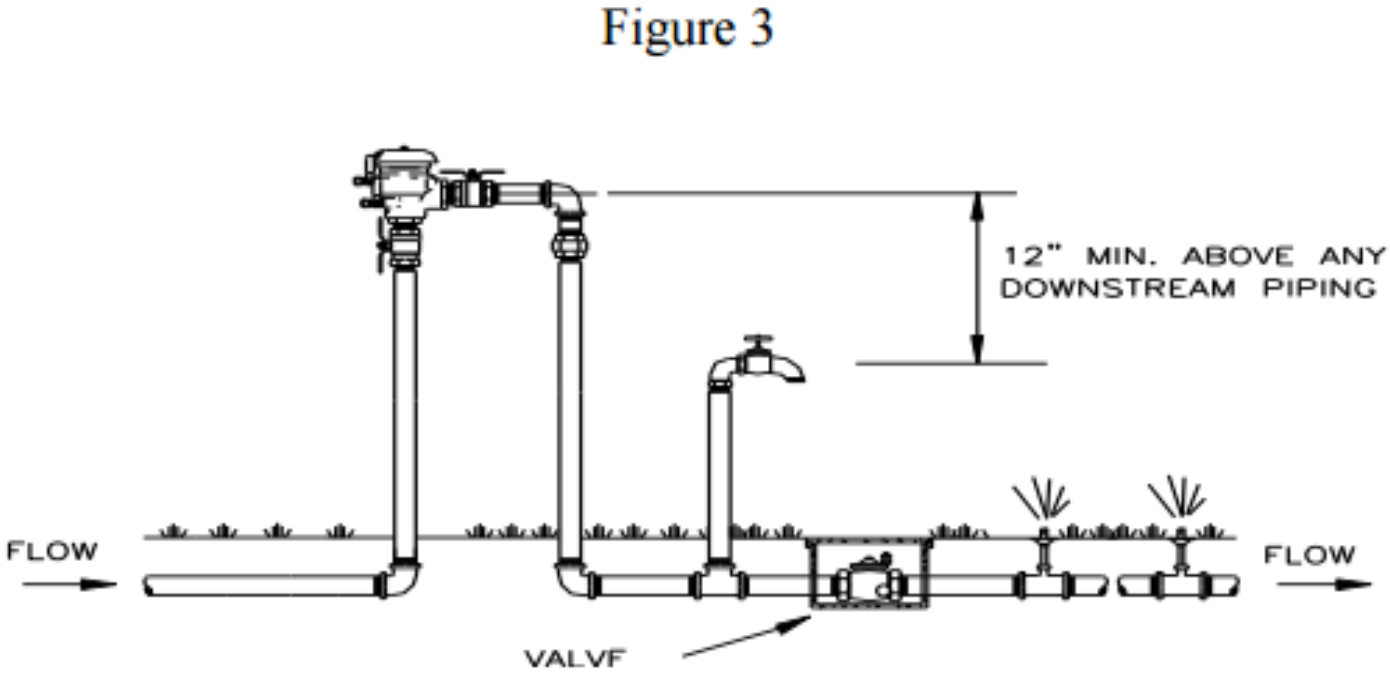
- Backsiphonage Only
- Non-Health Hazzard/Pollutant
- Health hazard /Contaminant

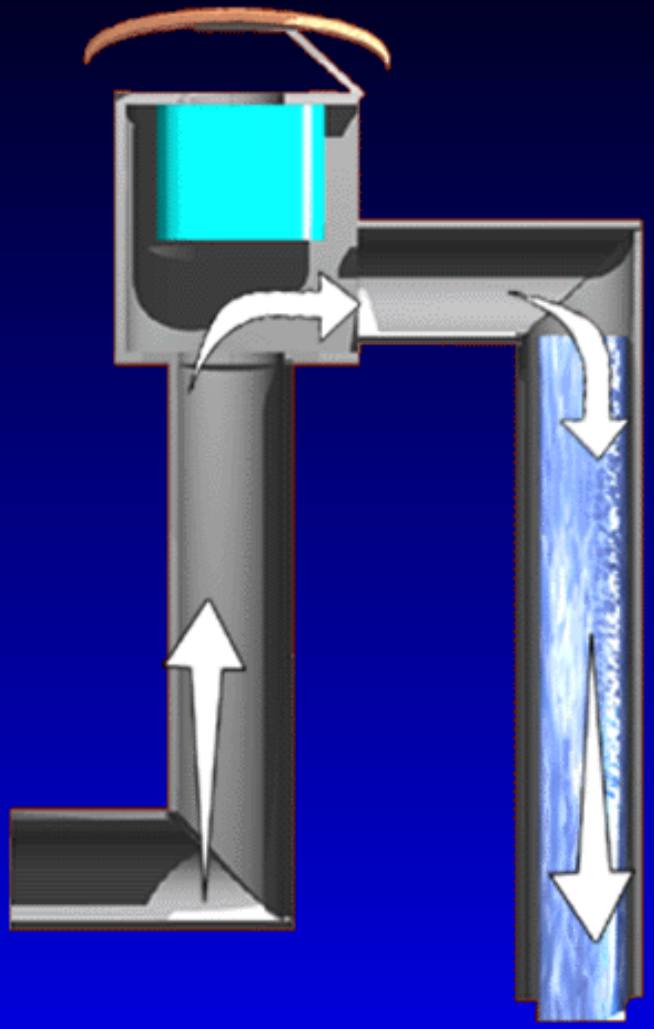
Installation Issues

- See Figure 3 OAR 333-061-0071
- Installed where occasional water discharge ok
- Adequate spacing for maintenance and testing
- Installed minimum 12” above highest down stream piping and outlets
- No means of imposing backpressure
- May have downstream valves

PVB or SVB

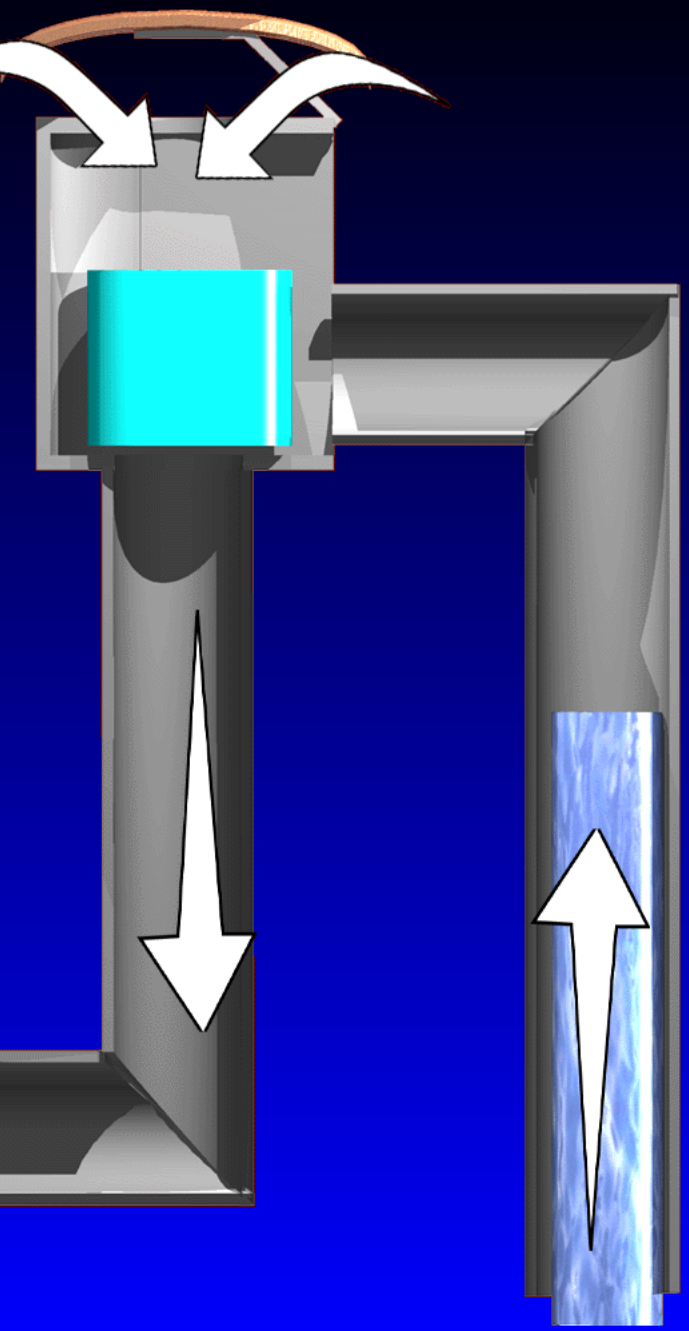
What is it good for? Installation Issues





Atmospheric Vacuum Breaker (AVB)

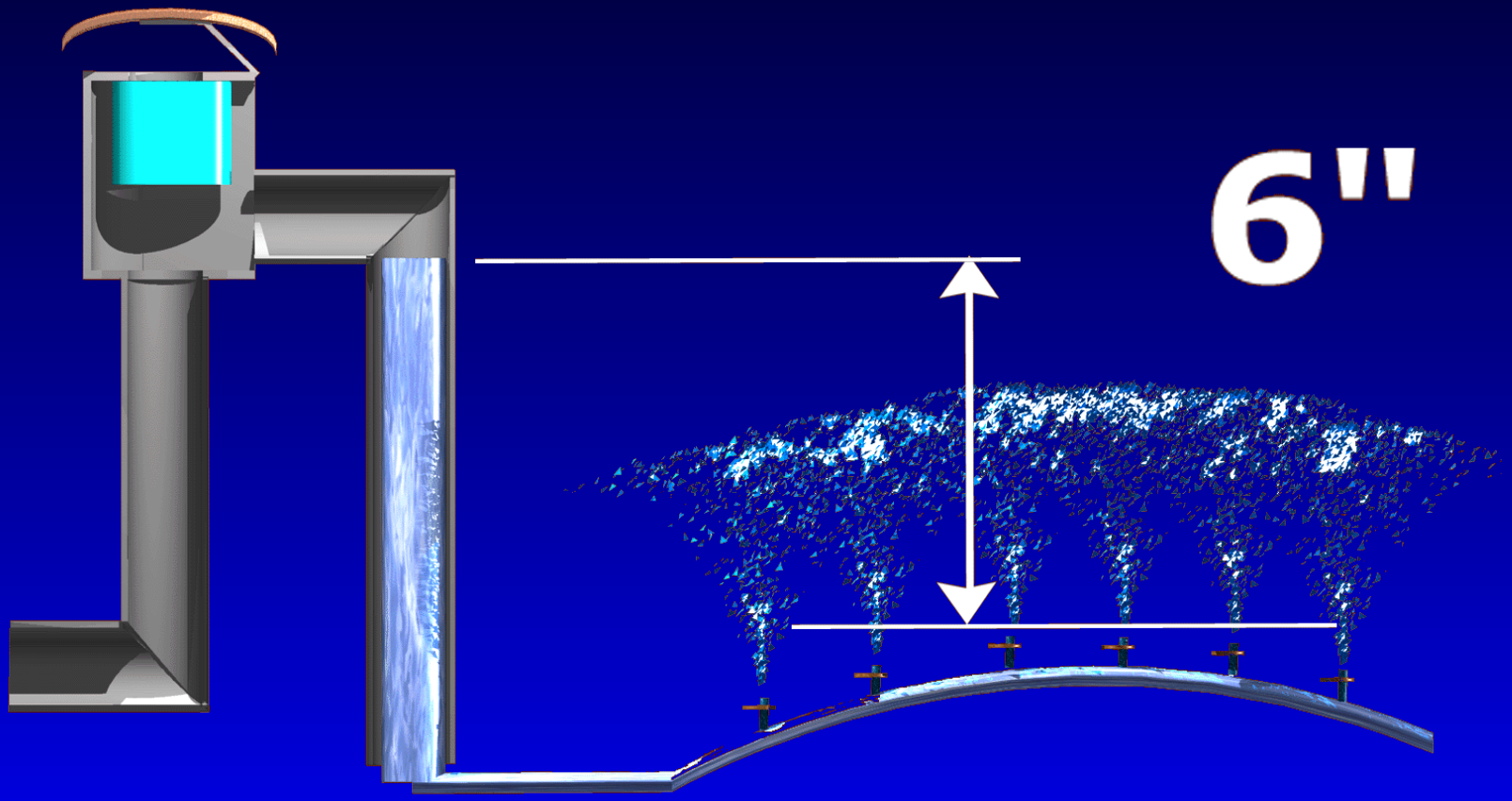
Normal Flow



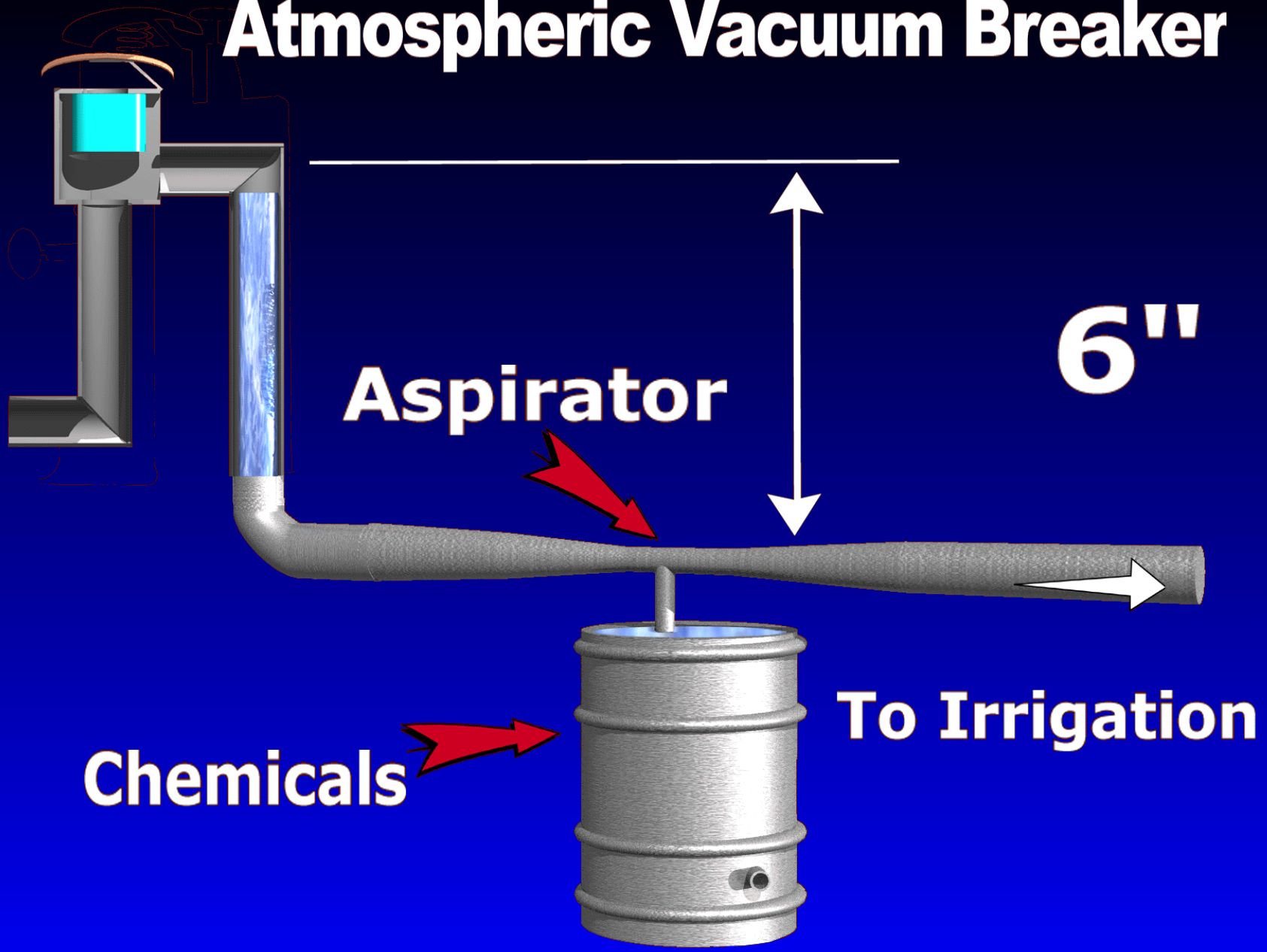
Atmospheric Vacuum Breaker (AVB)

Backsiphonage

Atmospheric Vacuum Breaker

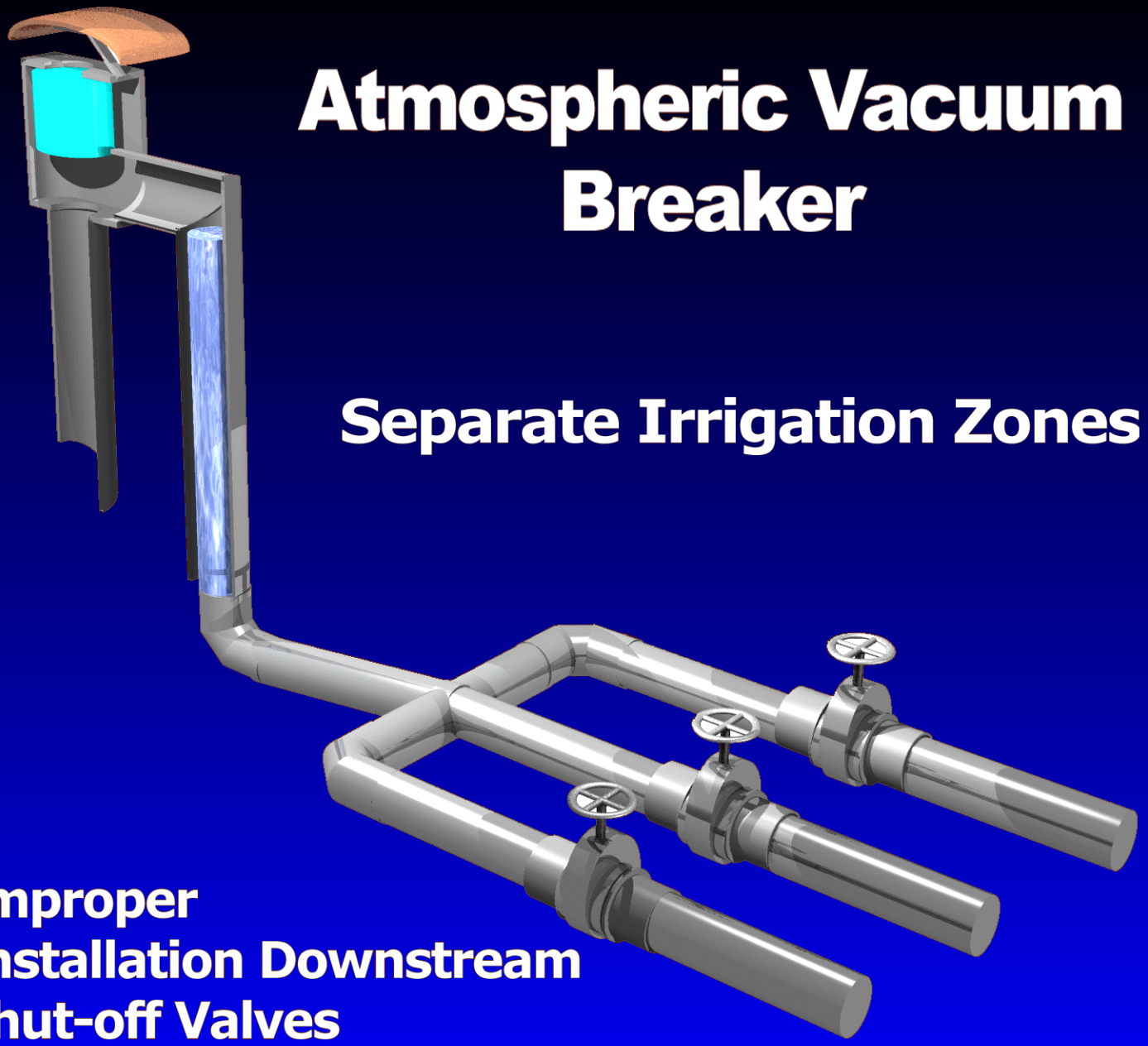


Atmospheric Vacuum Breaker



Atmospheric Vacuum Breaker

Separate Irrigation Zones



Improper Installation Downstream Shut-off Valves

Atmospheric Vacuum Breaker (AVB)

What is it good for?

- Backsiphonage Only
- Non-Health Hazzard/Pollutant
- Health hazard /Contaminant

Installation Issues

- See Figure 3 OAR 333-061-0071
- No means of shut-off downstream
- Not installed in dusty or corrosive atmosphere
- Not subject to flooding
- Be used intermittently
- Approved under the Oregon Plumbing Specialty code for non-testable devices

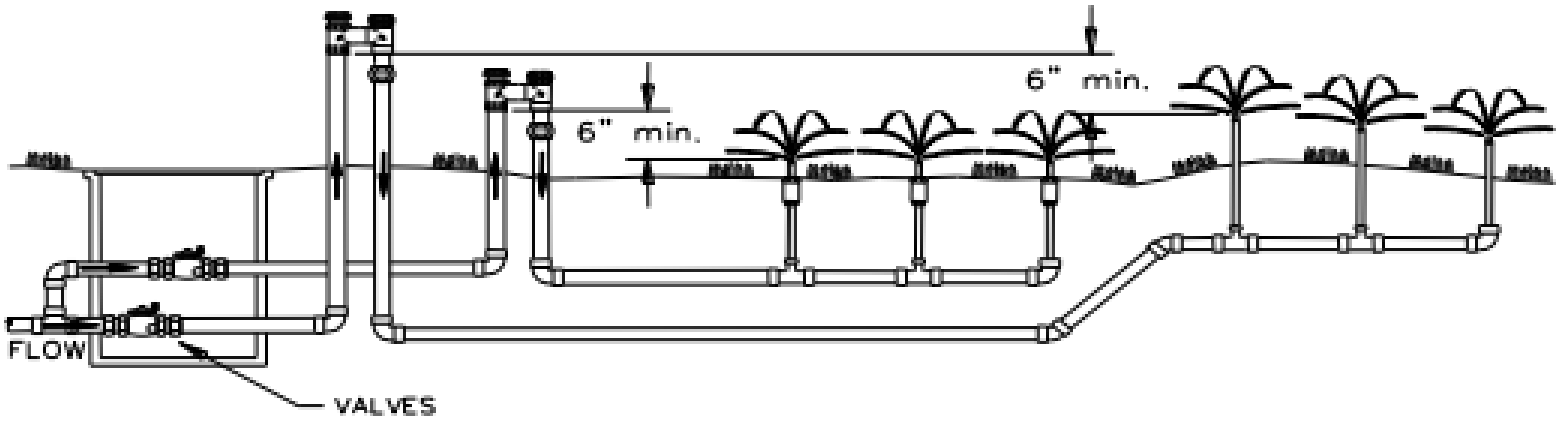
Atmospheric Vacuum Breaker (AVB)

What is it good for?

Installation Issues

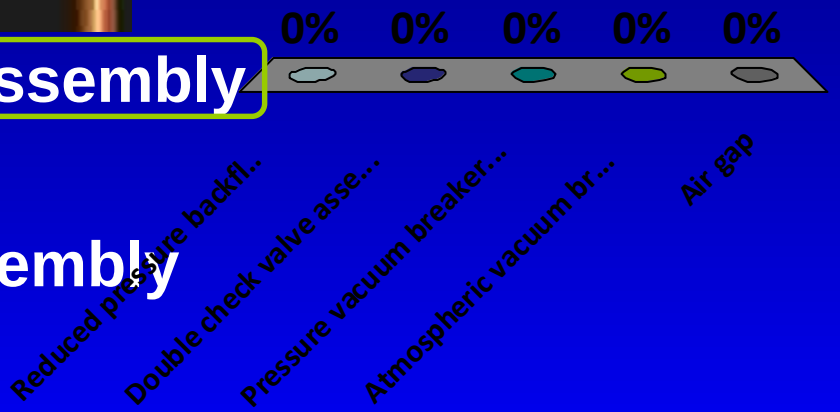
- See Figure 3 OAR 333-061-

Figure 4



The following image is a _____ assembly?

A. Reduced pressure backflow assembly
B. Double check valve assembly
C. Pressure vacuum breaker assembly
D. Atmospheric vacuum breaker
E. Air gap



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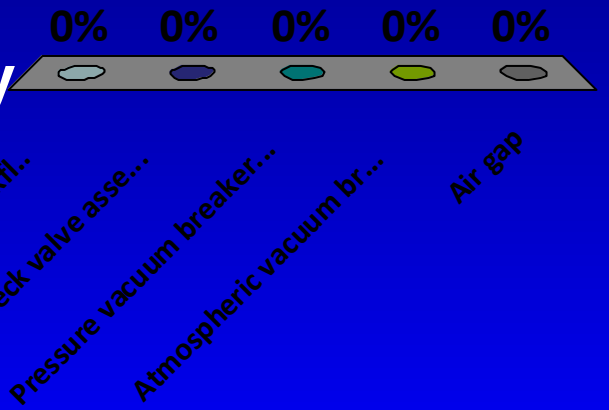

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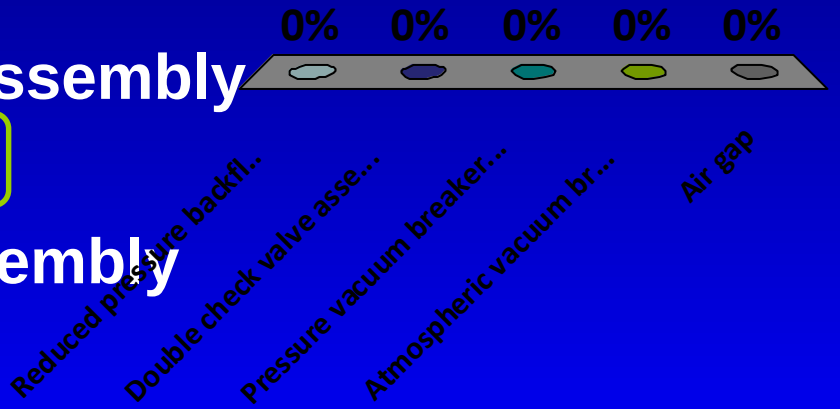

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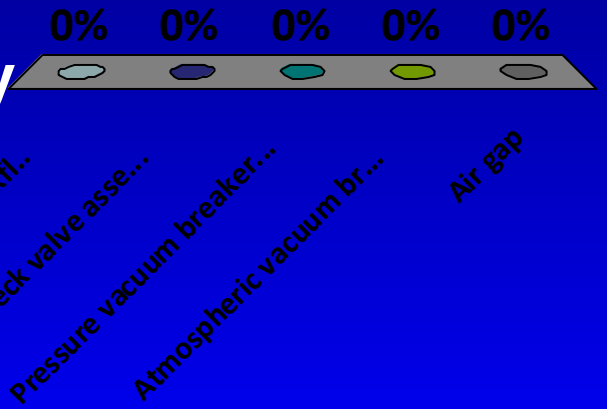

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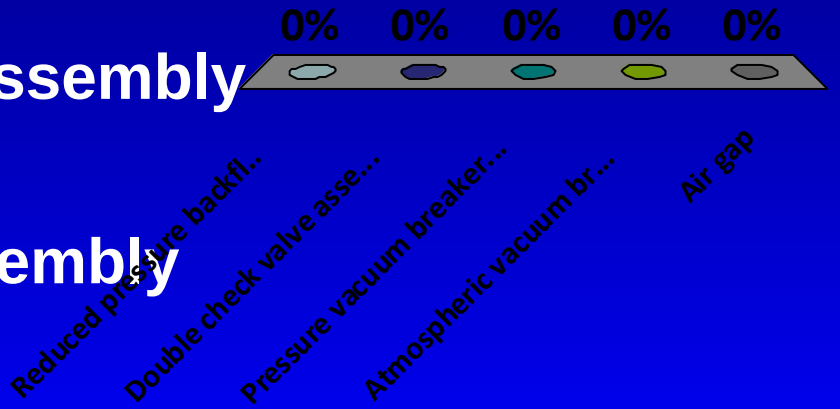

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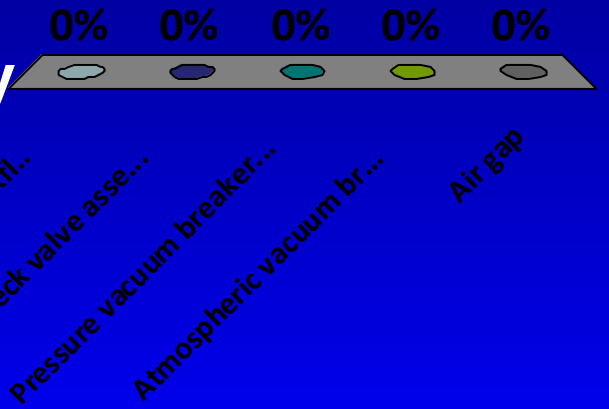

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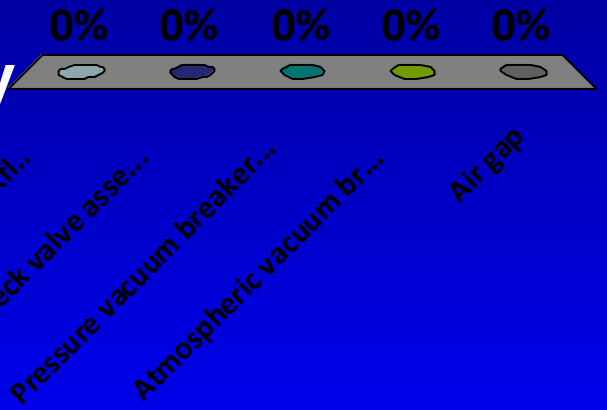

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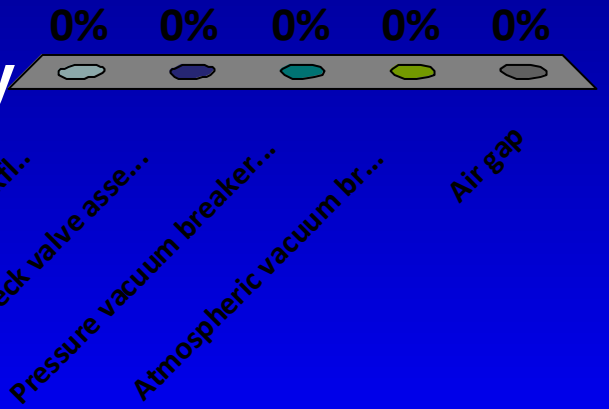

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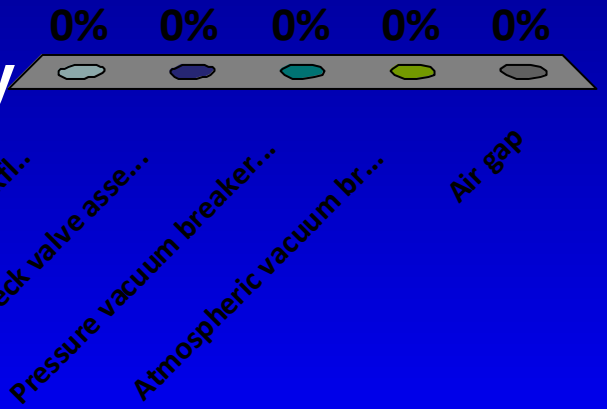


Direct or Indirect Cross-connection?

A. Direct

B. Indirect

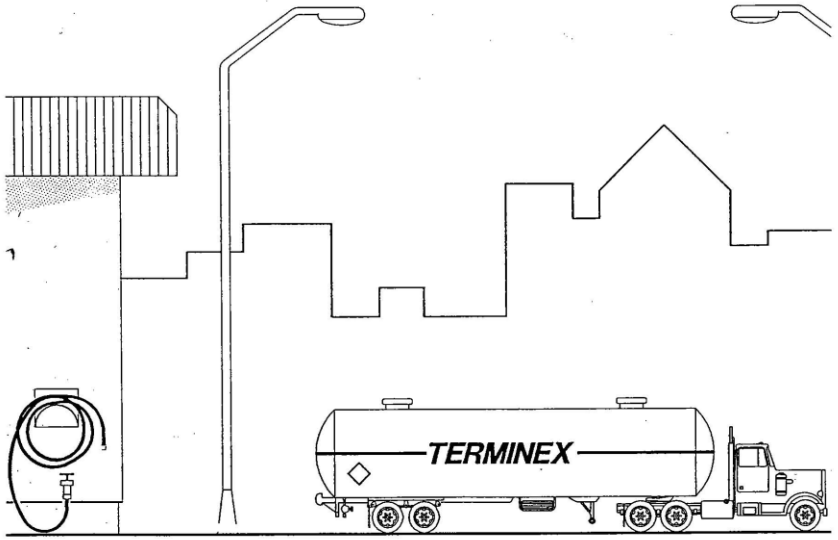
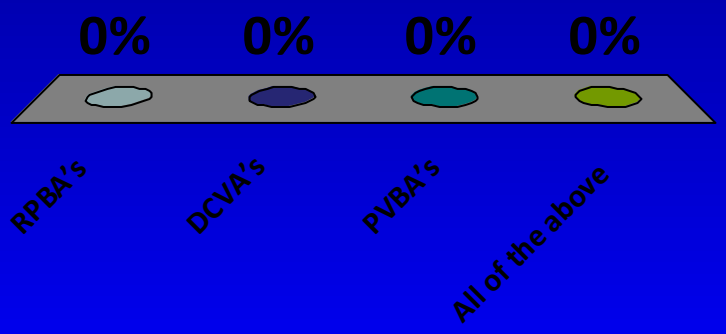


Figure 1. The garden hose can be connected to the truck tank for flushing. This represents a potential cross connection.

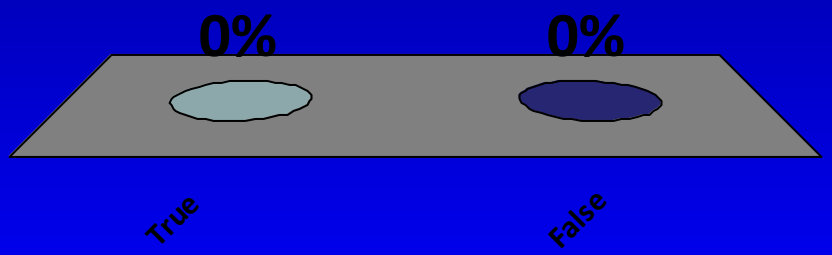
A differential pressure gauge is used to test the following Assemblies?

A. RPBA's
B. DCVA's
C. PVBA's
D. All of the above



A backflow device is testable?

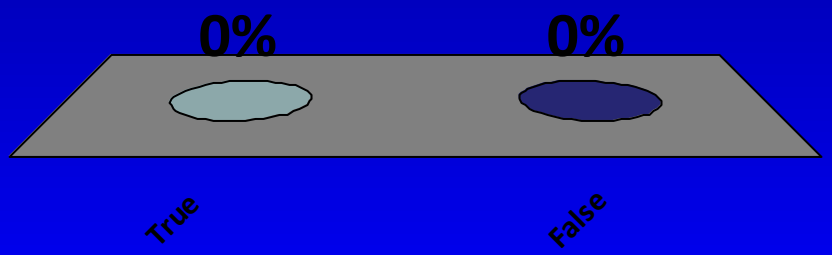
A. True
B. False



A backflow assembly is testable?

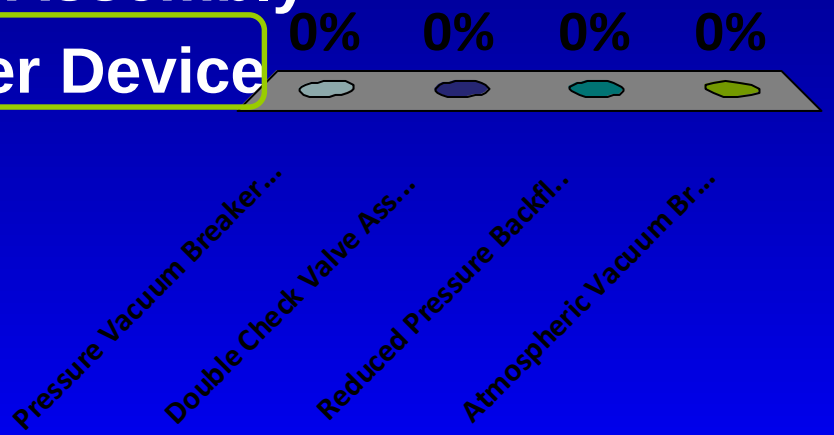
A. True

B. False



Which of the following is not testable?

A. Pressure Vacuum Breaker Assembly
B. Double Check Valve Assembly
C. Reduced Pressure Backflow Assembly
D. Atmospheric Vacuum Breaker Device



Reduced Pressure Principal Assembly (RP)

Figure 1

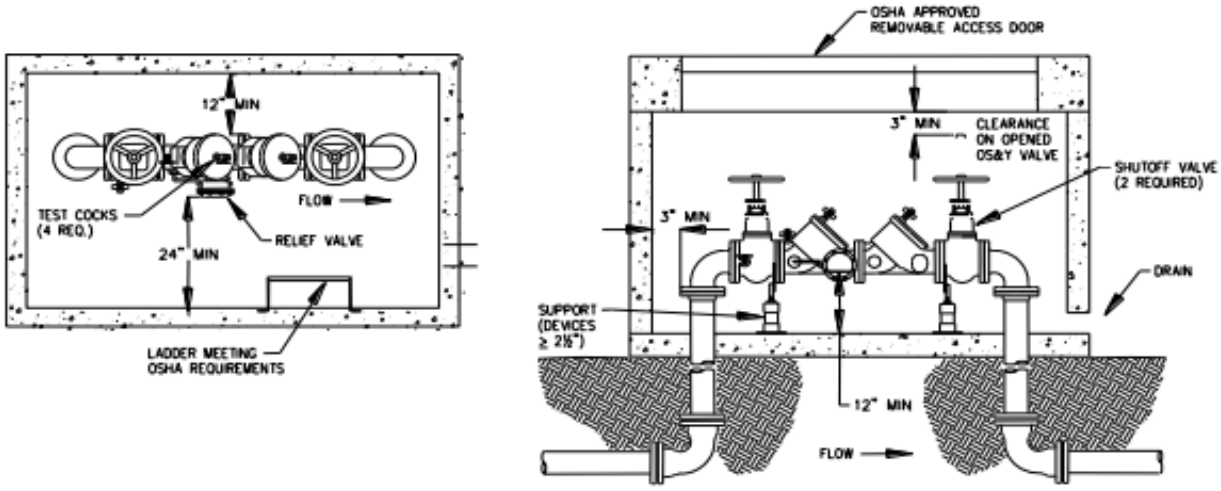


Figure 1. Installation clearances for the RP.

Approved for:	Installation Requirements
Backsiphonage Backpressure Non-Health Hazard/Pollutant High Health Hazard/Contaminant	• Vertical installation only if approved • Above 100 year flood • Never extended or plugged relief valve • Protected from freezing • Provided approved air gap drain • Shall not be installed in an enclosed vault or box unless a bore-sighted drain to daylight is provided where there is an unrestricted straight-line opening in the enclosure that vents to grade, and is sized and constructed to adequately drain the full flow discharge from the reduced pressure principle backflow prevention assembly thus preventing any potential for submersion of the assembly; • May be installed with less clearances if <= 2” pipes • Not installed > 5’ unless OSHA approved permanent platform • Installation clearances shown in Figure 1.

Double Check Assembly (DC)

Figure 2

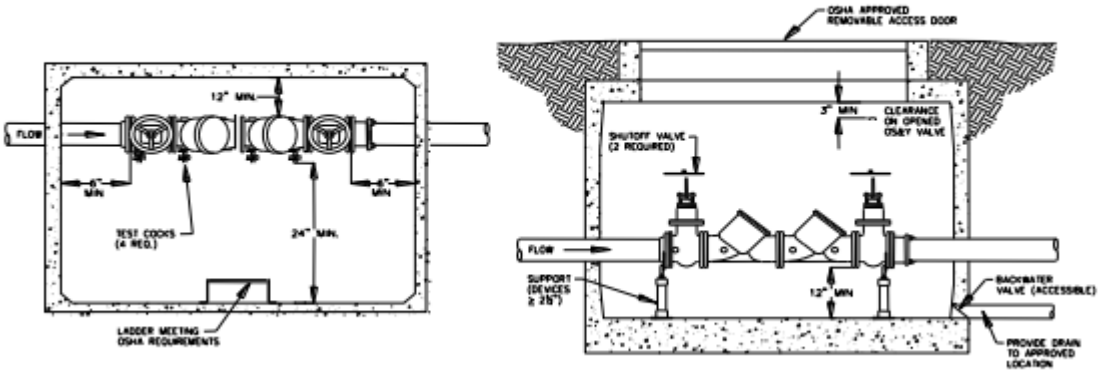


Figure 2. Installation clearances for the DC.

Approved for:	Installation Requirements
Backsiphonage Backpressure Non-Health Hazard/Pollutant	• Vertical and Horizontal installation if listed as H and V • May be installed below grade in a vault provided water-tight test cock plugs or caps • Shall not be subject to continuous immersion • Needs adequate drainage but not connected to sanitary or storm drain • Protected from freezing • May be installed with less clearances if <= 2" pipes • Not installed > 5' unless OSHA approved permanent platform • Installation clearances shown in Figure 2.

Pressure Vacuum Breaker (PVB) or Spill Resistant Vacuum Breaker (SVB) Assemblies

Figure 3

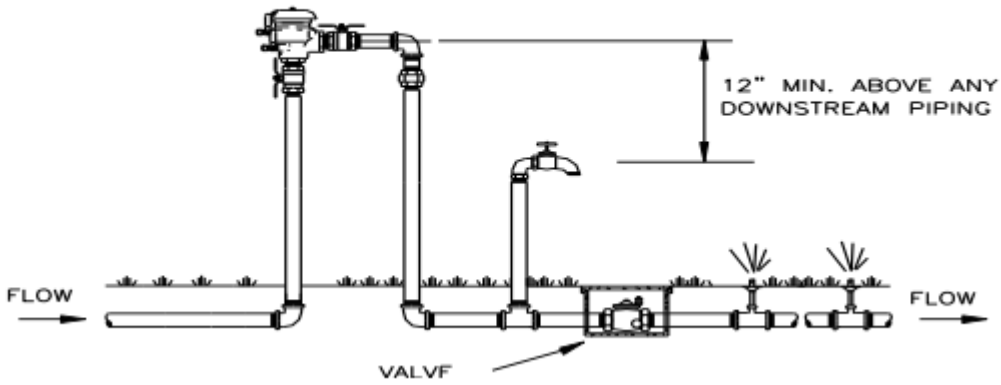


Figure 2. Installation clearances for the DC.

Approved for:	Installation Requirements
Backsiphonage ONLY Non-Health Hazard/Pollutant Health Hazard/Contaminant	• Installed where occasional water discharge ok • Adequate spacing for maintenance and testing • Installed minimum 12” above highest down stream piping and outlets • No means of imposing backpressure • May have downstream valves

Atmospheric Vacuum Breaker (AVB)

Figure 4

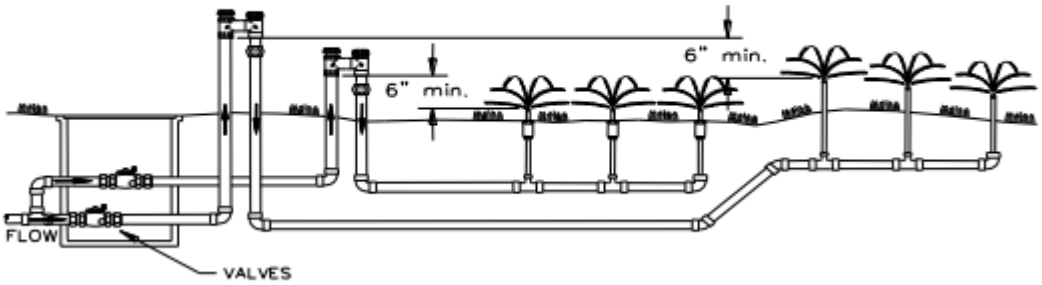


Figure 1. Installation clearances for the RP.

Approved for:	Installation Requirements
Backsiphonage Non-Health Hazard/Pollutant High Health Hazard/Contaminant	• No means of shut-off downstream • Not installed in dusty or corrosive atmosphere • Not subject to flooding • Be used intermittently • Approved under the Oregon Plumbing Specialty code for non-testable devices • No means of shut-off downstream • Not installed in dusty or corrosive atmosphere • Not subject to flooding

Which Backflow Preventer?

Clackamas Community College
Oregon Backflow Training (OBT)

Dr. James T. Nurmi, Ph.D.

503-594-3813
http://www.clackamas.edu/wet

Three 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)?

	Indirect Backsiphonage Only		Direct Backsiphonage & Backpressure
	Continous Use	Non-Continous Use	
Health Hazard	PVB/SVB RP Air Gap	AVB PVB/SVB RP Air Gap	RP Air Gap
Non-Health Hazard	PVB/SVB RP DC Air Gap	AVB PVB/SVB DC RP Air Gap	DC RP Air Gap

Three Questions:

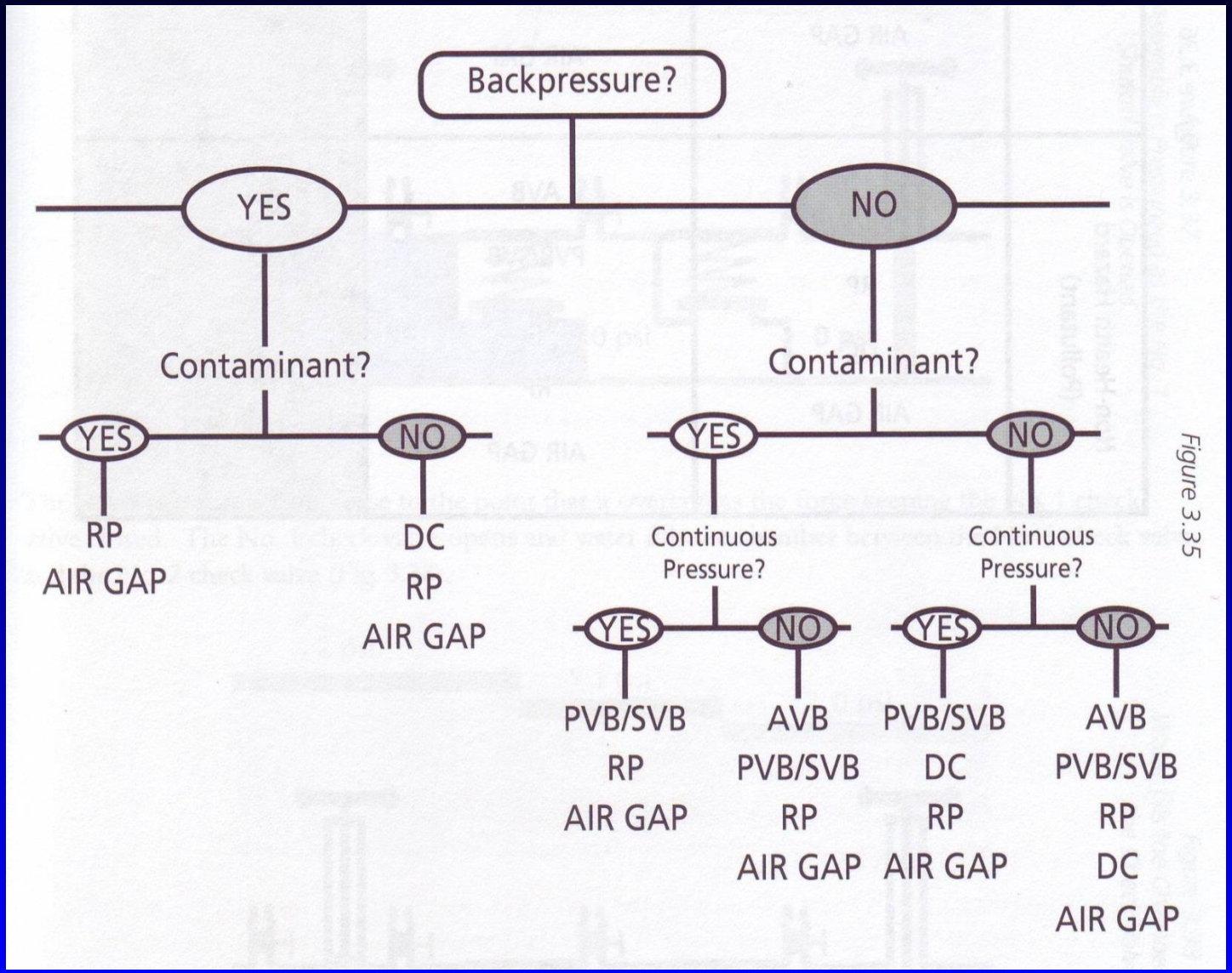


Figure 3.35

Typical Cross Connections

Give me some examples of where you might have a cross connection?

Hose Bib

Janitors Faucet

Laundry Tub Faucets

Hose Bibs: Medical Whirlpool

Hose and Spray

Hose and Spray

Fill Valve


damage which may result in water
leakage and property damage.
PROOF OF USING IN-TAN CLEANERS WILL VOID WARRANTY
1003817-6-A
20629
09/12/2007

Backflow Preventer

Boiler

Electric Boiler

Cooling Towers

Coffee Makers

Carbonator

Carbonator

Soap Dispenser

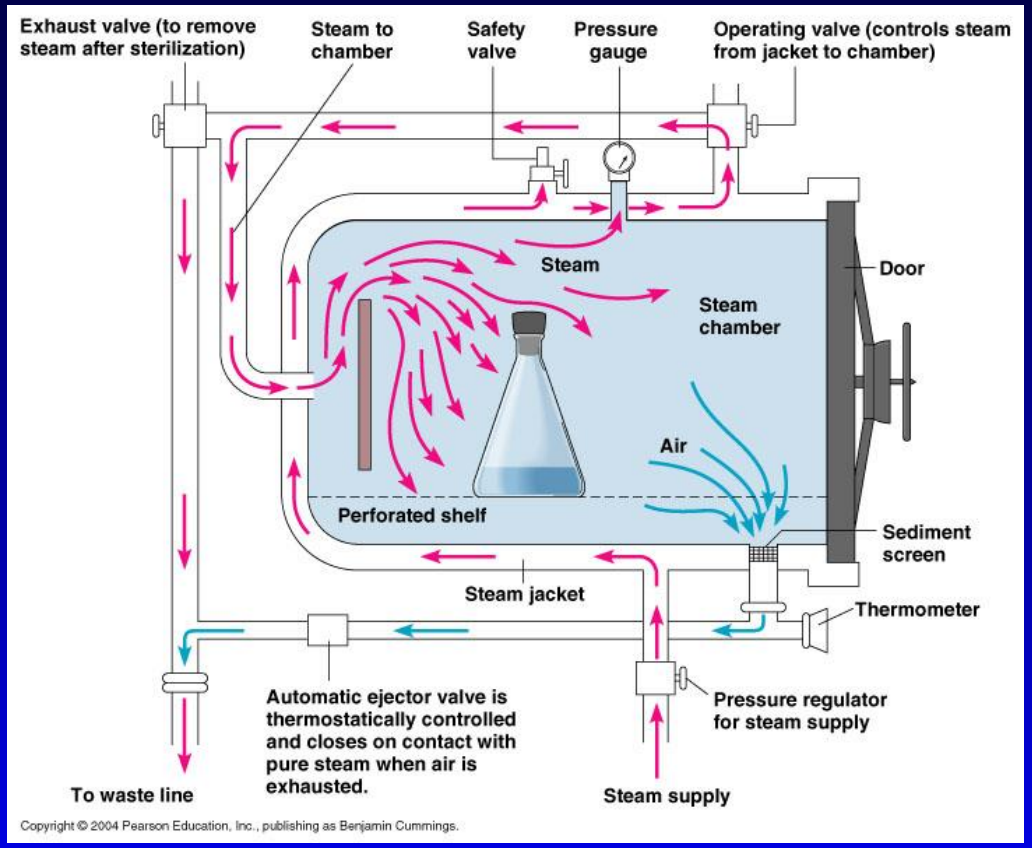
Commercial Dishwasher

Parts Washer

Chemical Dispenser

Mortuary Table

Autoclaves


Exhaust valve (to remove steam after sterilization)
Steam to chamber
Safety valve
Pressure gauge
Operating valve (controls steam from jacket to chamber)
Steam
Door
Steam chamber
Air
Perforated shelf
Sediment screen
Steam jacket
Thermometer
Automatic ejector valve is thermostatically controlled and closes on contact with pure steam when air is exhausted.
Pressure regulator for steam supply
To waste line
Steam supply
Copyright © 2004 Pearson Education, Inc., publishing as Benjamin Cummings.

Car Wash

- Hose thread vacuum breakers may be installed without a permit by anyone.
- A licensed plumber working under a permit is required for any other form of cross connection correction.

What's wrong with this picture?

What's Wrong?

What's Wrong?

What's Wrong?

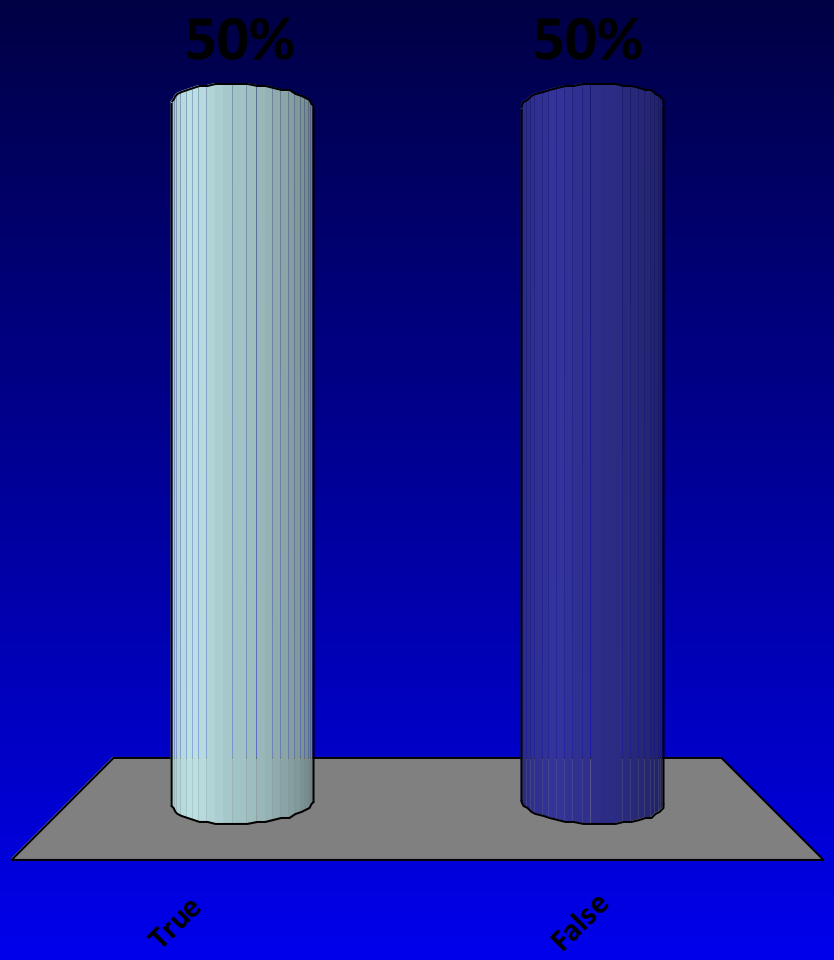
What's Wrong?

What's Wrong?

As a water purveyor, you can adopt an ordinance which is more stringent that the state regulations.

A. True

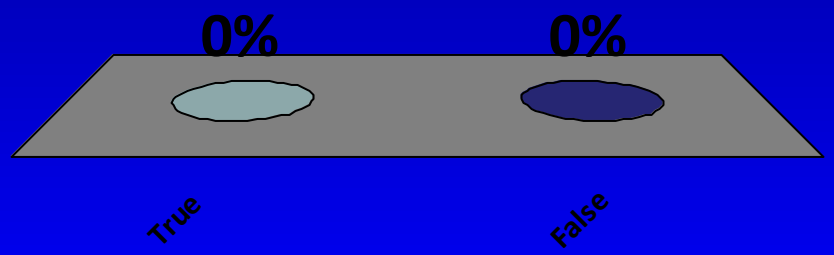
B. False



Single family residences do not have the kinds of hazards that would require backflow prevention assemblies.

A. True

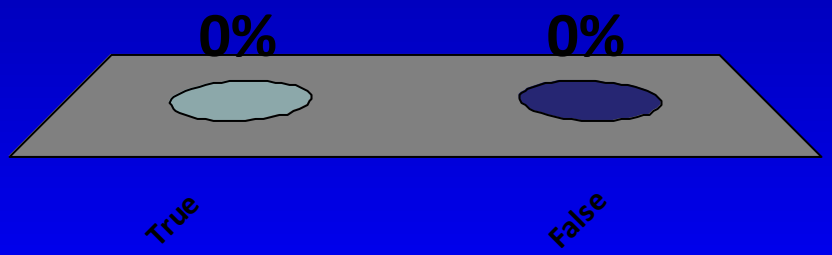
B. False



Only individuals with water certification can conduct a cross-connection control program.

A. True

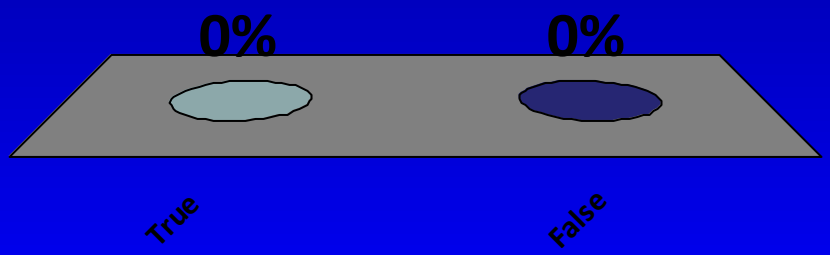
B. False



The person in charge of the cross connection control program should review plans on new construction.

A. True

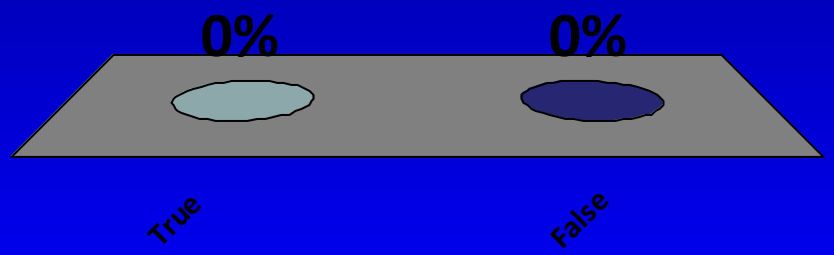
B. False



A good record system will include all correspondence, inspection reports, test reports, and related information.

A. True

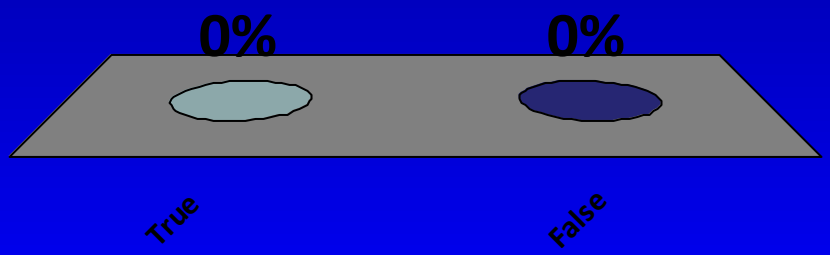
B. False



Only water systems with more than 1000 service connections are required to have a certified specialist to run their program.

A. True

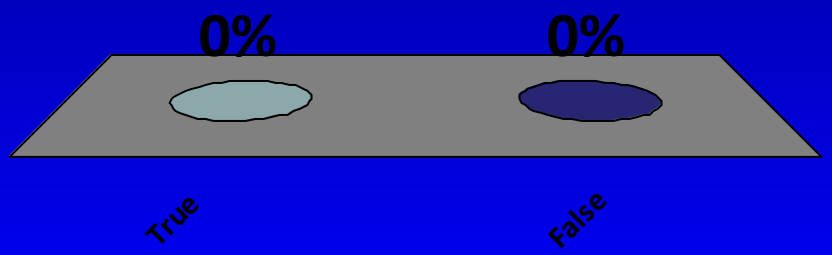
B. False



When requiring backflow prevention for new or existing facilities, it is important to require only approved assemblies.

A. True

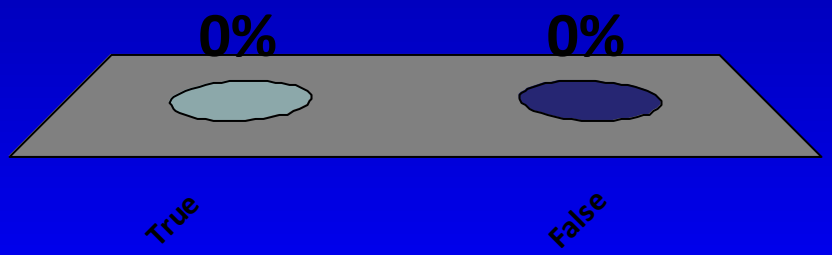
B. False



It is recommended that inspections be prioritized.

A. True

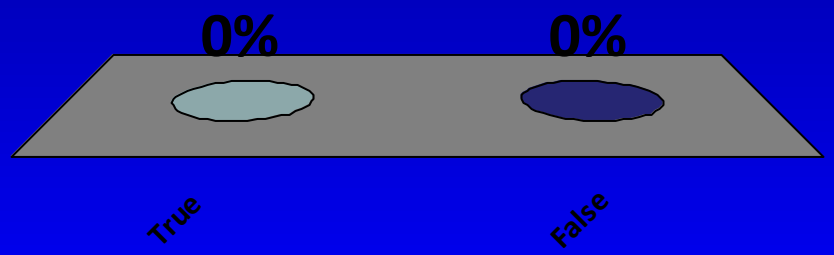
B. False



An air gap provides protection against backsiphonage and backpressure.

A. True

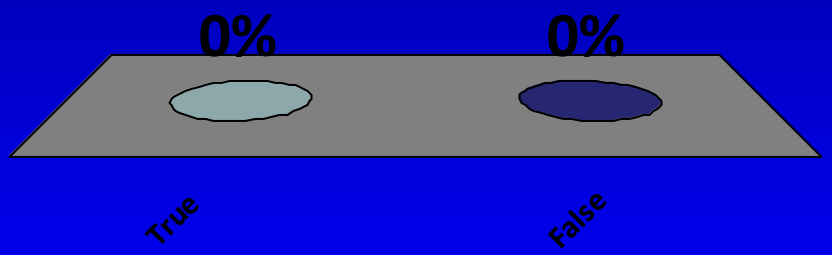
B. False



It is sometimes less expensive to require two smaller assemblies than one large assembly.

A. True

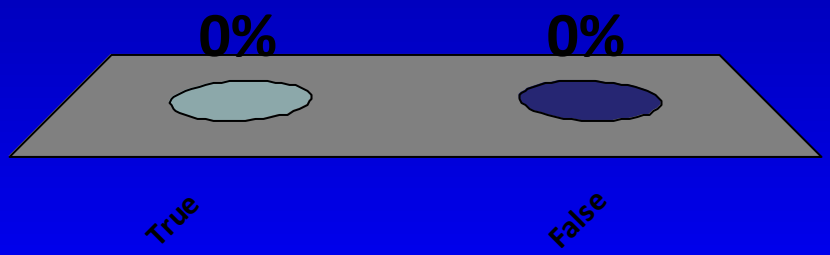
B. False



A community water system cross connection program does not require an ordinance or enabling authority.

A. True

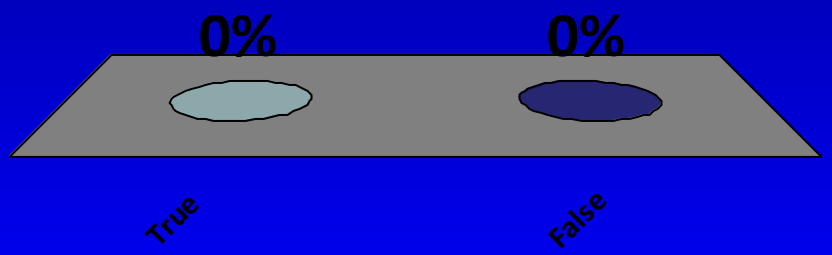
B. False



An RP and DC can only be installed at the property line.

A. True

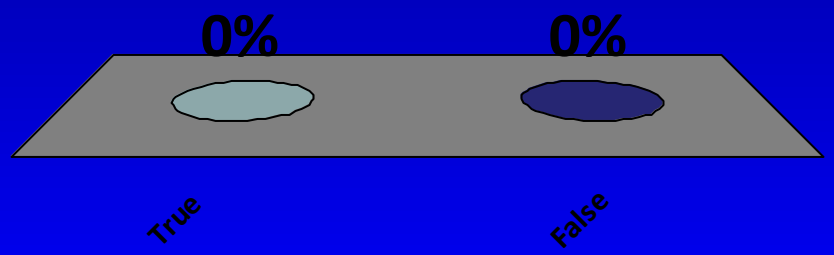
B. False



Water purveyors are excluded from liability suits that result from backflow incidences.

A. True

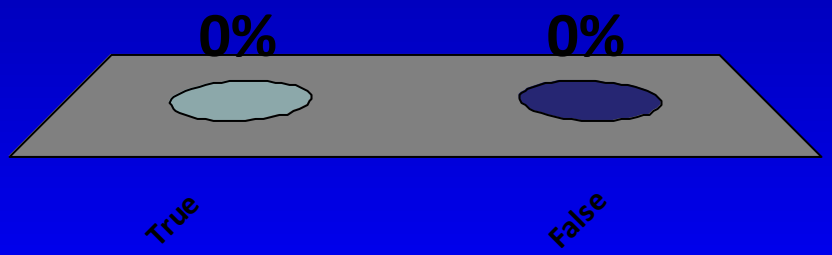
B. False



A community water system is one which serves people at places where they live.

A. True

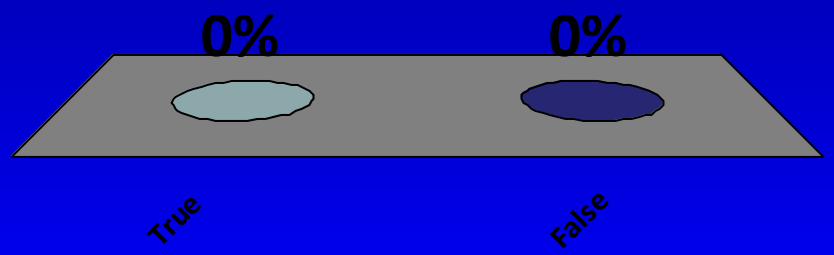
B. False



In community water systems, water suppliers are responsible for controlling and eliminating cross connections.

A. True

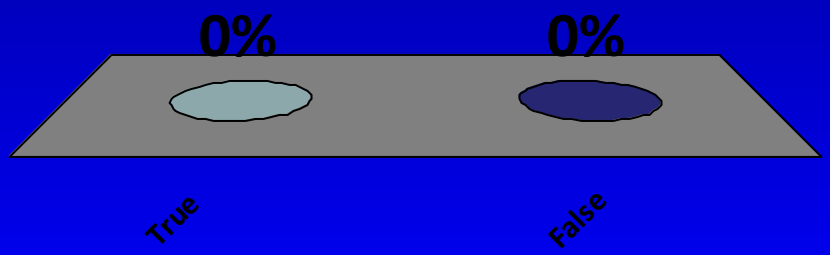
B. False



The type of backflow assembly required for a given situation must be commensurate with the degree of hazard.

A. True

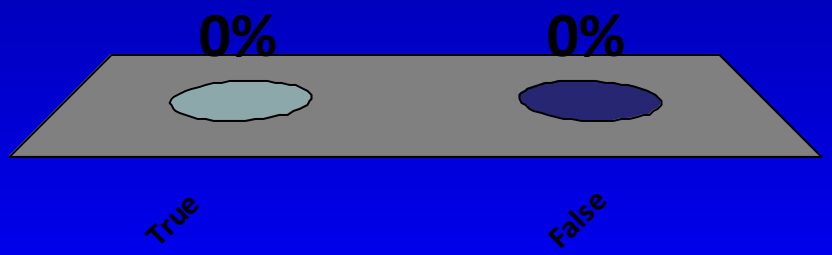
B. False



You should provide the owner with proper installation requirements for the assembly that is required.

A. True

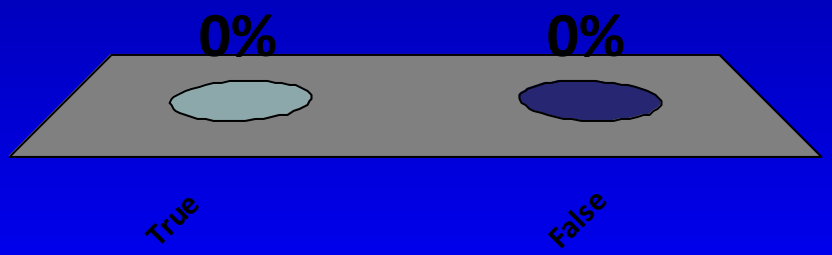
B. False



A solar water heating system can creat a cross connection hazard

A. True

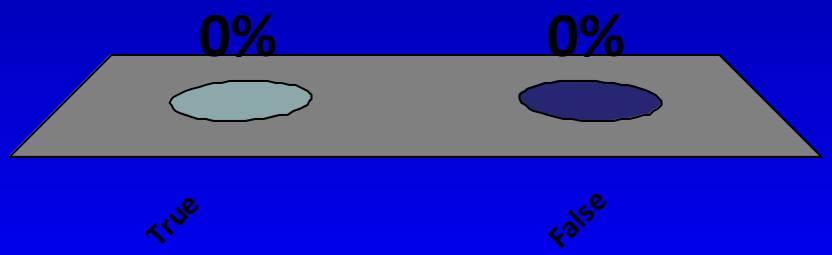
B. False



A medical facility may have potentially hazardous cross connections.

A. True

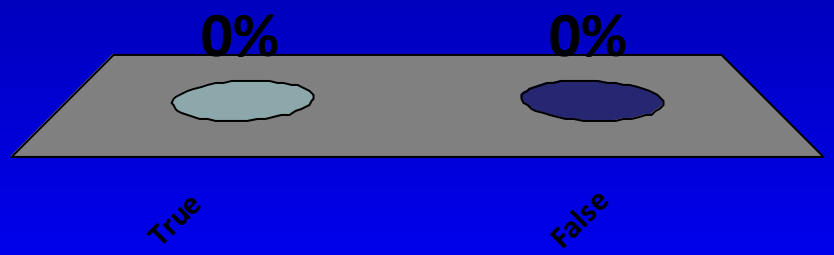
B. False



A RP should normally be installed on all boilers and similar pressure vessels.

A. True

B. False



Which of the following require an air gap or RPBA to be installed at the water service connection.

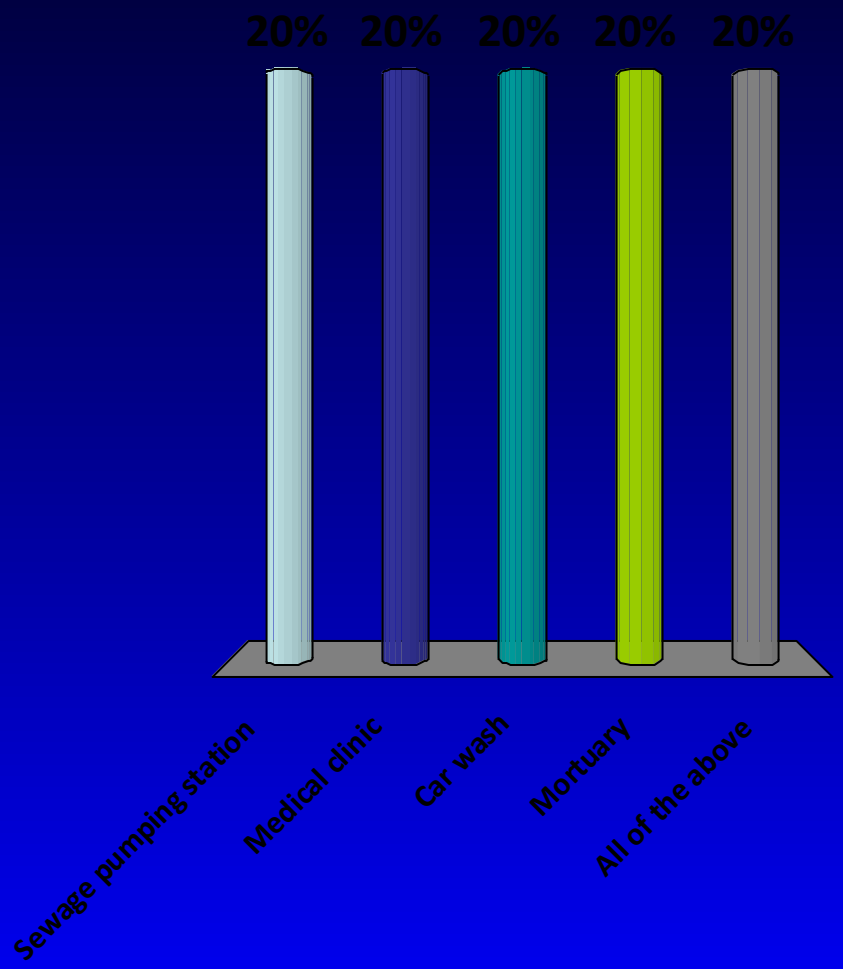
A. Sewage pumping station

B. Medical clinic

C. Car wash

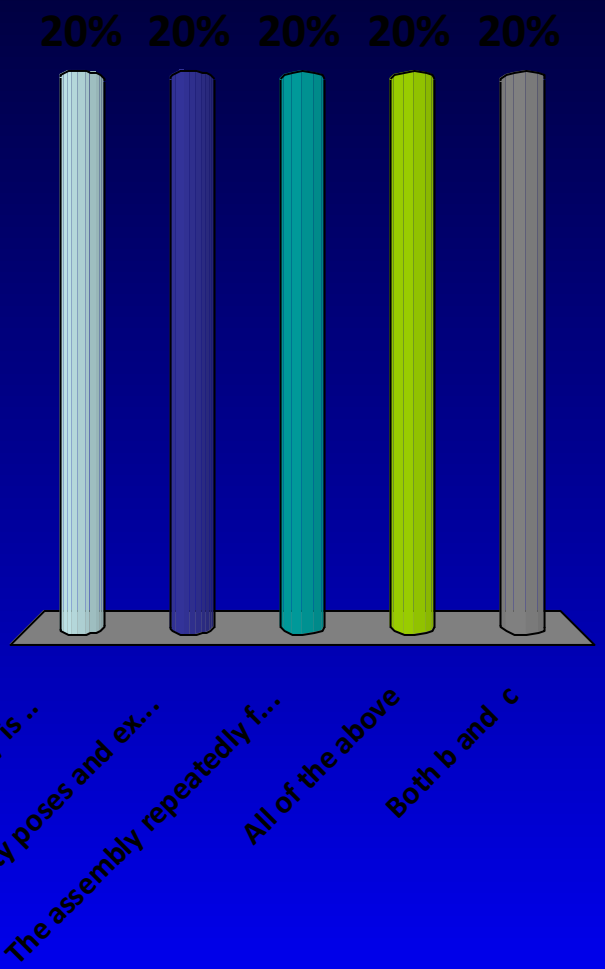
D. Mortuary

E. All of the above



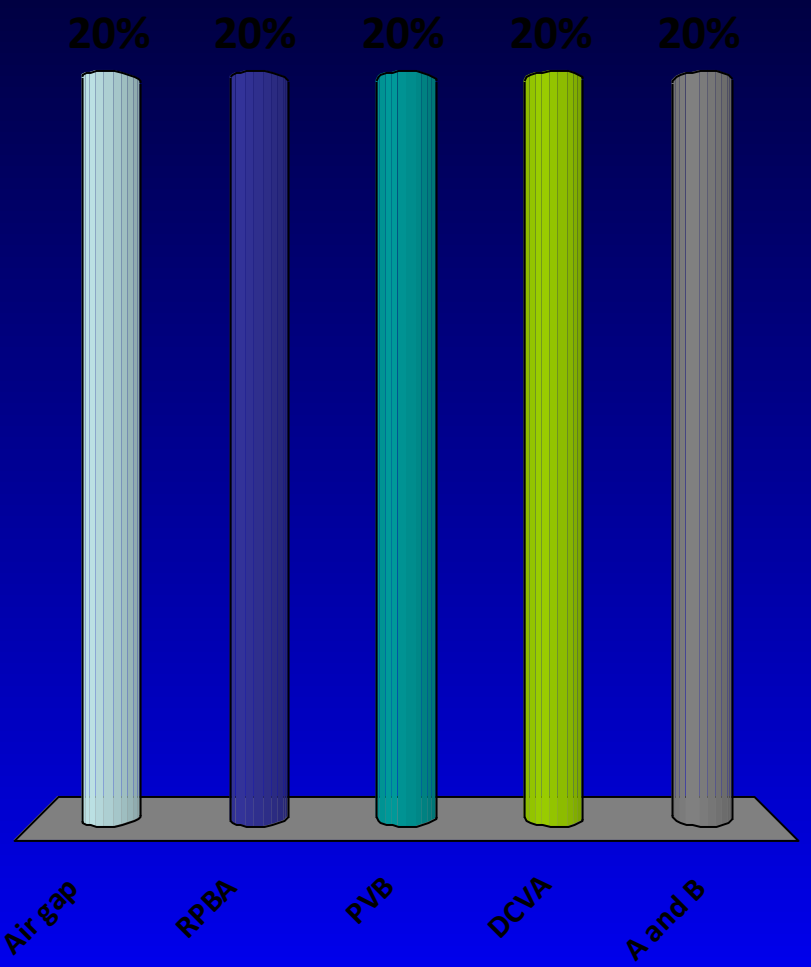
A water purveyor can require a more frequent than usual testing schedule for a backflow assembly, under the following conditions:

A. The backflow assembly is no longer approved
B. The facility poses and extreme health risk
C. The assembly repeatedly fails
D. All of the above
E. Both b and c



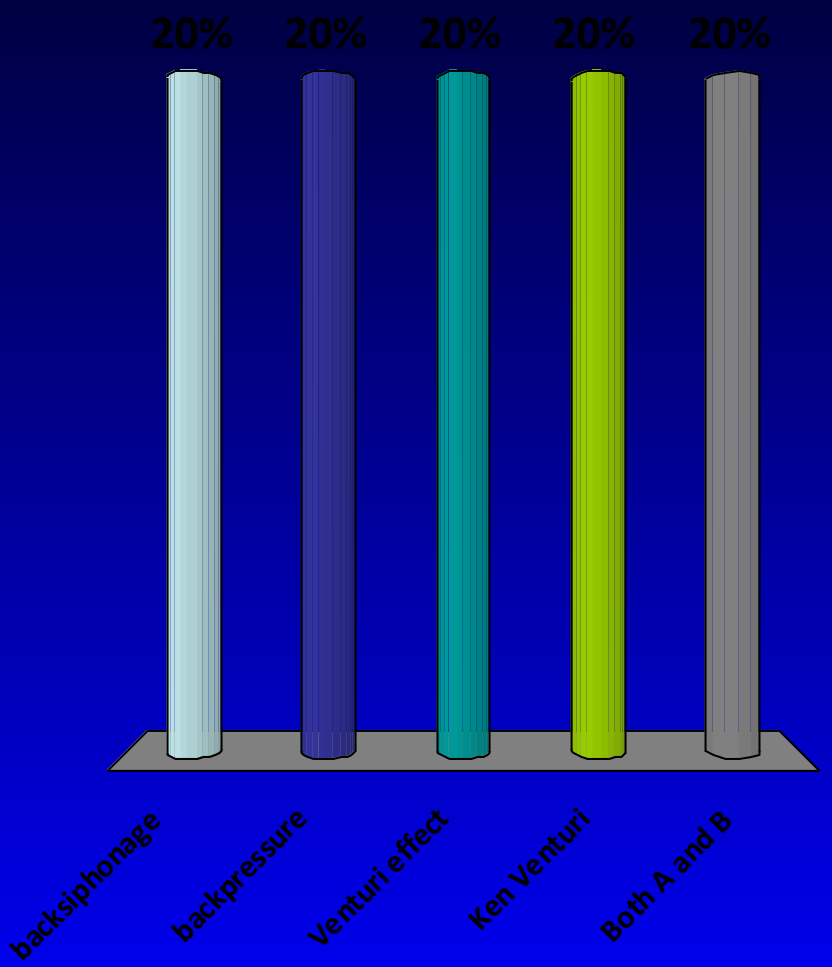
Which of the following meet requirements for in-plant protection on a boiler

A. Air gap
B. RPBA
C. PVB
D. DCVA
E. A and B



Elevated piping can produce backflow due to:

A. backsiphonage
B. backpressure
C. Venturi effect
D. Ken Venturi
E. Both A and B



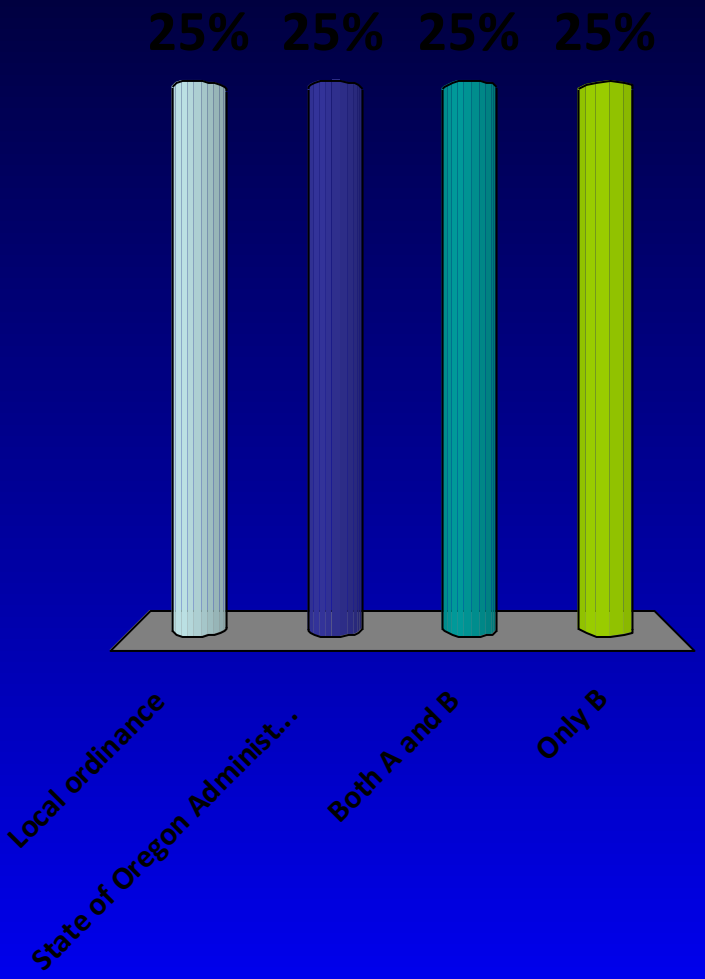
The authority to enforce a cross connection control program can come from which of the following?

A. Local ordinance

B. State of Oregon Administrative Rules

C. Both A and B

D. Only B



How many people should be delegated the responsibility for organizing and carrying out the cross connection control program.

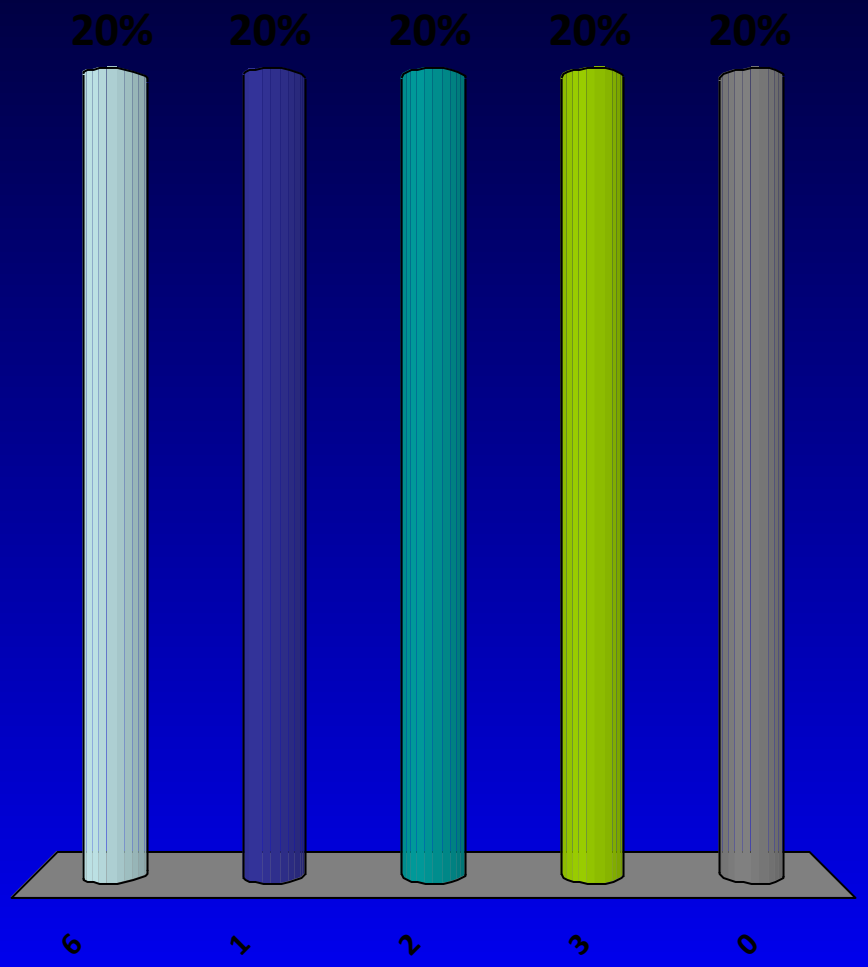
A. 6

B. 1

C. 2

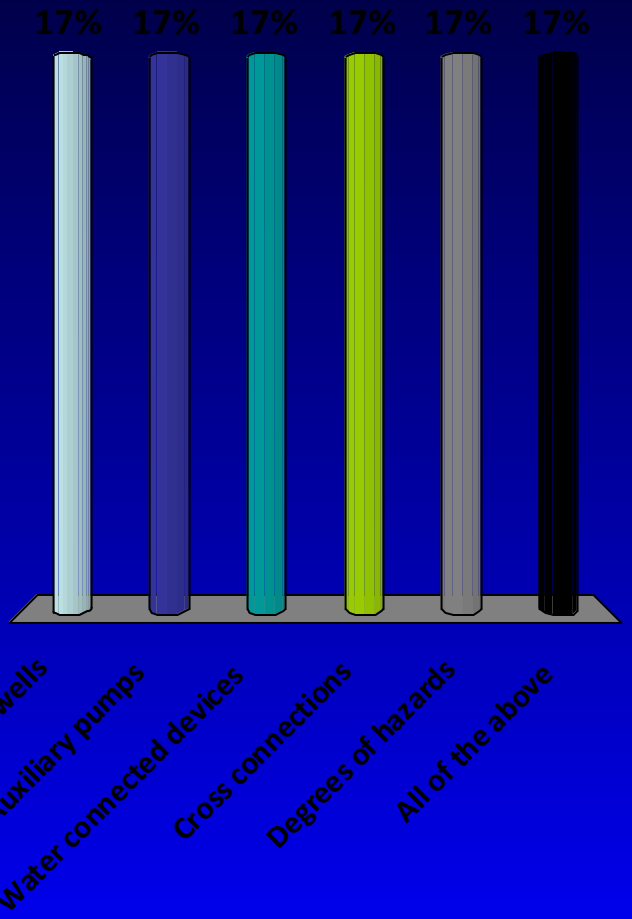
D. 3

E. 0



When doing a survey, what should you look for?

A. wells
B. Auxiliary pumps
C. Water connected devices
D. Cross connections
E. Degrees of hazards
F. All of the above



Current Backflow Events

- http://www.abpa.org/?page=Incidents

Safety

- https://www.washingtonpost.com/news/morning-mix/wp/2017/01/18/three-utility-workers-descend-to-their-deaths-in-florida-manhole-overcome-by-fumes/?utm_term=.0f714cb9262c

Oregon Administrative Rules: Cross Connection

Clackamas Community College
Oregon Backflow Training (OBT)

Dr. James T. Nurmi, Ph.D.

503-594-3813
http://www.clackamas.edu/wet

Cross Connection Control Requirements

1. Water suppliers shall undertake cross connection control programs to protect the public water systems from pollution and contamination.

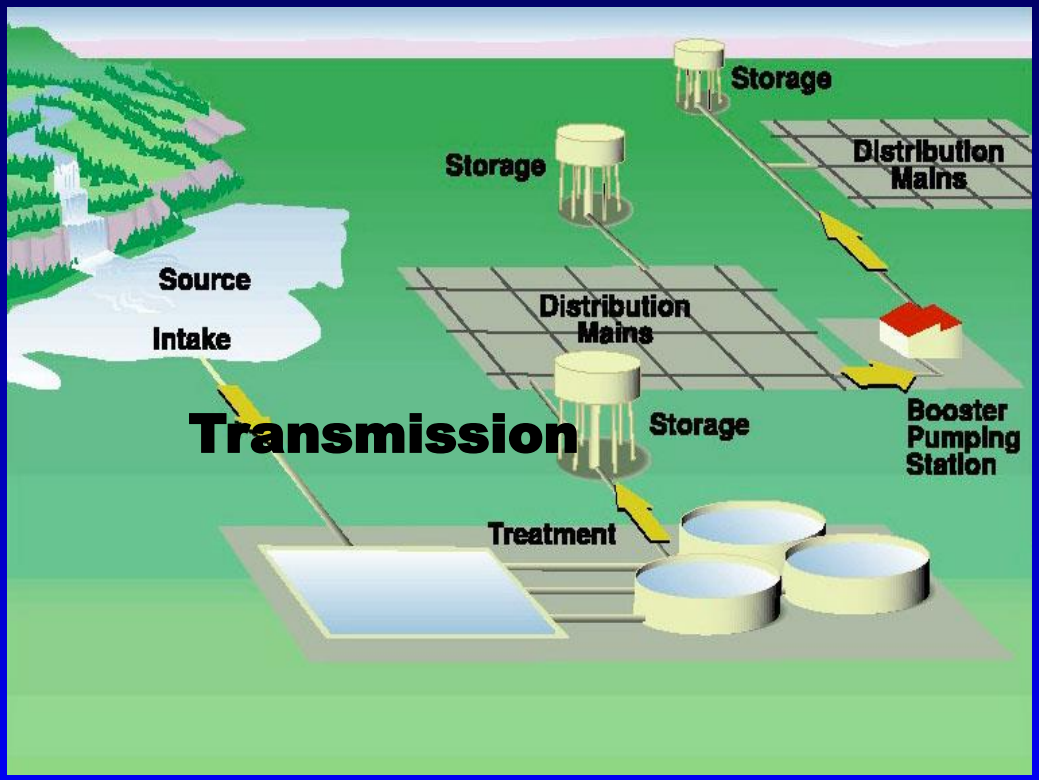
2. For the purposes of this rule, the following definitions apply:

(a) "Pollutant" means a substance that creates an impairment of the quality of the water to a degree which does not create a hazard to the public health, but which does adversely affect the aesthetic qualities of the water.

(b) "Thermal expansion" means the pressure increase due to a rise in water temperature that occurs in water piping systems when such systems become "closed" by the installation of a backflow prevention assembly or other means, and will not allow for expansion beyond that point of installation

Cross Connection Control Requirements

3. The water supplier's responsibility for cross connection control shall begin at the water supply source, include all public treatment, storage, and distribution facilities under the water supplier's control, and end at the POD to the water user's premises.



Major Components

- Source
- Treatment
- Storage
- Distribution, transmission, pumping facilities

Cross Connection Control Requirements

4. Water suppliers shall develop and implement cross connection control programs that meet the minimum requirements set forth in these rules.

5. Water suppliers shall develop a procedure to coordinate cross connection control requirements with the appropriate local administrative authorities having jurisdiction.

6. The water supplier shall ensure that inspections of approved air gaps, approved devices, and inspections and tests of approved backflow prevention assemblies protecting the public water system are conducted:

Cross Connection Control Requirements

4. Water suppliers shall develop and implement cross connection control programs that meet the minimum requirements set forth in these rules.

5. Water suppliers shall develop a procedure to coordinate cross connection control requirements with the appropriate local administrative authorities having jurisdiction.

6. The water supplier must ensure that inspections of approved air gaps, approved devices, and inspections and tests of approved backflow prevention assemblies protecting the public water system are conducted:

   (a) By an Authority certified backflow assembly tester with a currently calibrated gauge;
   (b) At the time of installation, repair or relocation;
   (c) At least once every 12 months after installation;
   (d) More frequently than every 12 months for approved backflow prevention assemblies that repeatedly fail, or
   are protecting health hazard cross connections, as determined by the water supplier;
   (e) After a backflow incident; or
   (f) After an approved air gap is re-plumbed.

Cross Connection Control Requirements

7. Approved air gaps, approved devices, or approved backflow prevention assemblies, found not to be functioning properly shall be repaired, replaced or replumbed by the water user or premises owner, as defined in the water supplier's local ordinance or enabling authority, or the water supplier may take action in accordance with subsection (9)(a) of these rules.

8. A water user or premises owner who obtains water from a water supplier must notify the water supplier if they add any chemicals or substance to the water.

Cross Connection Control Requirements

9. Premises isolation requirements: (a)
    a. For service connections to premises listed or defined in Table 42 (Premises Requiring Isolation), the water supplier shall ensure an approved backflow prevention assembly or an approved air gap is installed;
        A. Premises with cross connections not listed or defined in Table 42 (Premises Requiring Isolation), shall be individually evaluated. The water supplier shall require the installation of an approved backflow prevention assembly or an approved air gap commensurate with the degree of hazard on the premises, as defined in Table 43 (Backflow Prevention Methods);
        B. In lieu of premise isolation, the water supplier may accept an in premises approved backflow prevention assembly as protection for the public water system when the approved backflow prevention assembly is installed, maintained and tested in accordance with these rules.
        C. (C) The water supplier may on a case by case basis provide an exemption to mandatory premises isolation requirements to premises listed on Table 42, if the premises contains no health hazards.

Cros…nts

9. Premise…
   a. For… …2
   (Pr… …an
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   A. …ble 42
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   B. …n
   …tection

Table 42

Premises Requiring Isolation* By an Approved Air Gap **or** Reduced Pressure Principle Type Of Assembly Health Hazard
Agricultural (for example, farms, dairies)
Beverage bottling plants**
Car washes
Chemical plants
Commercial laundries and dry cleaners
Premises where both reclaimed and potable water are used
Film processing plants
Food processing plants
Medical centers (for example, hospitals, medical clinics, nursing homes, veterinary clinics, dental clinics, blood plasma centers)
Premises with irrigation systems that use the water supplier's water with chemical additions (for example, parks, playgrounds, golf courses, cemeteries, housing estates)
Laboratories
Metal plating industries
Mortuaries
Petroleum processing or storage plants
Piers and docks
Radioactive material processing plants and nuclear reactors
Wastewater lift stations and pumping stations
Wastewater treatment plants
Premises with piping under pressure for conveying liquids other than potable water and the piping is installed in proximity to potable water piping
Premises with an auxiliary water supply that is connected to a potable water supply

Premises where the water supplier is denied access or restricted access for survey
Premises where the water is being treated by the addition of chemical or other additives

* Refer to OAR 333-061-0070(8) premises isolation requirements.

** A Double Check Valve Backflow Prevention Assembly could be used if the water supplier determines there is only a non-health hazard at a beverage bottling plant.

Cross Connection Control Requirements

9. Premises isolation requirements: (a)
   a. For service connections to premises listed or defined in Table 42 (Premises Requiring Isolation), the water supplier shall ensure an approved backflow prevention assembly or an approved air gap is installed;
      A. Premises with cross connections not listed or defined in Table 42 (Premises Requiring Isolation), shall be individually evaluated. The water supplier shall require the installation of an approved backflow prevention assembly or an approved air gap commensurate with the degree of hazard on the premises, as defined in Table 43 (Backflow Prevention Methods);
      B. In lieu of premise isolation, the water supplier may accept an inpremises approved backflow prevention assembly as protection for the public water system when the approved backflow prevention assembly is installed, maintained and tested in accordance with these rules.
      C. (C) The water supplier may on a case by case basis provide an exemption to mandatory premises isolation requirements to premises listed on Table 42, if the premises contains no health hazards.

Degree of Hazard

- **Non-Health Hazard or Pollutant**
- **Health Hazard or Contaminant**

Pollutant

- **Non-Health Hazard: aesthetically objectionable (smells, tastes bad, looks bad) but does not hurt the consumer.**

- **Give some examples?**

Contaminant

- **Health Hazard: a substance that has either a acute or chronic effect on the consumers health**
- **Give Examples?**
- **How do we protect the community from these CONTAMINANTS?**

Cross Connection Control Requirements

Table 43

Backflow Prevention Methods Used For Premises Isolation	
DEGREE OF IDENTIFIED HAZARD	
Non-Health Hazard (Pollutant)	Health Hazard (Contaminant)
Backsiphonage or Backpressure	Backsiphonage or Backpressure
Air Gap (AG)	Air Gap (AG)
Reduced Pressure Principle Backflow Prevention Assembly (RP)	Reduced Pressure Principle Backflow Prevention Assembly (RP)
Reduced Pressure Principle-Detector Backflow Prevention Assembly (RPDA)	Reduced Pressure Principle-Detector Backflow Prevention Assembly (RPDA)
Double Check Valve Backflow Prevention Assembly (DC)	
Double Check-Detector Backflow Prevention Assembly (DCDA)	

Stat. Auth.: ORS 448.131
Stats. Implemented: ORS 448.131, 448.278,

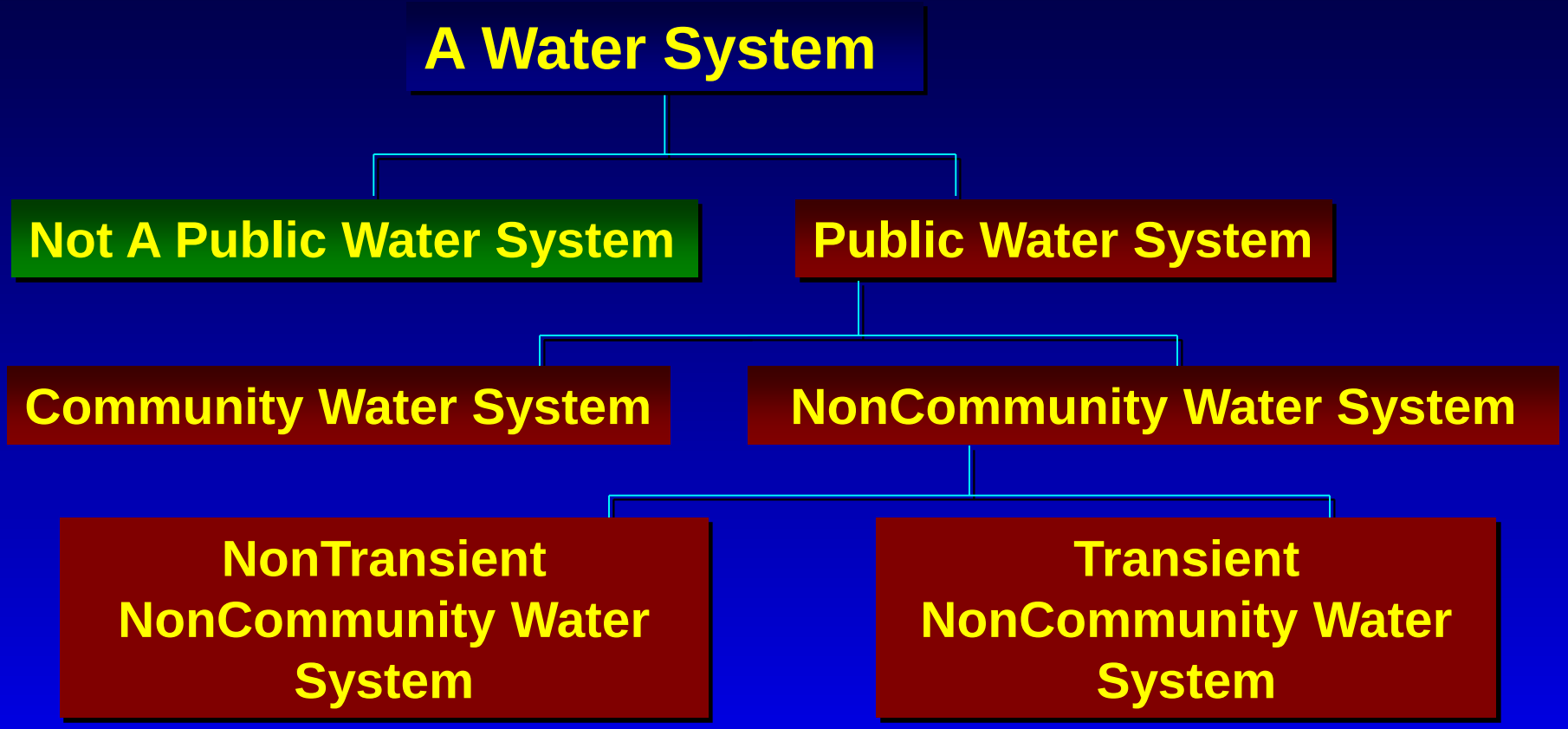
Cross Connection Control Requirements

9. Premises isolation requirements: (a)
    a. For service connections to premises listed or defined in Table 42 (Premises Requiring Isolation), the water supplier shall ensure an approved backflow prevention assembly or an approved air gap is installed;
        A. Premises with cross connections not listed or defined in Table 42 (Premises Requiring Isolation), shall be individually evaluated. The water supplier shall require the installation of an approved backflow prevention assembly or an approved air gap commensurate with the degree of hazard on the premises, as defined in Table 43 (Backflow Prevention Methods);
        B. In lieu of premise isolation, the water supplier may accept an in premises approved backflow prevention assembly as protection for the public water system when the approved backflow prevention assembly is installed, maintained and tested in accordance with these rules.

Cross Connection Control Requirements

9. Premises isolation requirements:
    b. Where premises isolation is used to protect against a cross connection, the following requirements apply;
        A. The water supplier shall:
            i. Ensure the approved backflow prevention assembly is installed at a location adjacent to the service connection or point of delivery;
            ii. Ensure any alternate location used must be with the approval of the water supplier and must meet the water supplier's cross connection control requirements; and
            iii. Notify the premises owner and water user, in writing, of thermal expansion concerns. (B)
        B. The premises owner shall:
            i. Ensure no cross connections exist between the point of delivery from the public water system and the approved backflow prevention assemblies, when these are installed in an alternate location; and
            ii. Assume responsibility for testing, maintenance, and repair of the installed approved backflow prevention assembly to protect against the hazard.

Regulatory Distinctions Between Water Systems



Public Water Systems

- 155,000 public water systems in the United States
- At least 15 service connections OR
- Serves 25 or more persons at least 60 days/year

Community Public Water Systems (CWS)

- At least 15 service connections OR Serves 25 or more persons
- Serves people year round
- 51,988 CWS served 292.3 million people
- 11,671 systems relied on surface water, serving 204.1 million people
- 40,301 systems relied on ground water, serving 88.1 million people

Community Public Water Systems (CWS)

CWS

PORTLAND WATER BUREAU
FROM FOREST TO FAUCET

CWS

Tualatin Valley Water District

CWS

CWS (rural)

Non-transient Non-Community Water Systems (NTNCWS)

- 15 connections/25 or more persons
- **Serves people at least 6 months (not year round)**
- 18,742 NTNCWS served 6.3 million people 688 systems relied on surface water, serving 788,360 people
- 18,041 systems relied on ground water, serving 5.5 million people

Non-transient Non-Community Water Systems (NTNCWS)

- **Schools, Factories, Office Buildings**

Stafford School

Office Buildings

Factories

Transient Non-Community Water Systems (TNCWS)

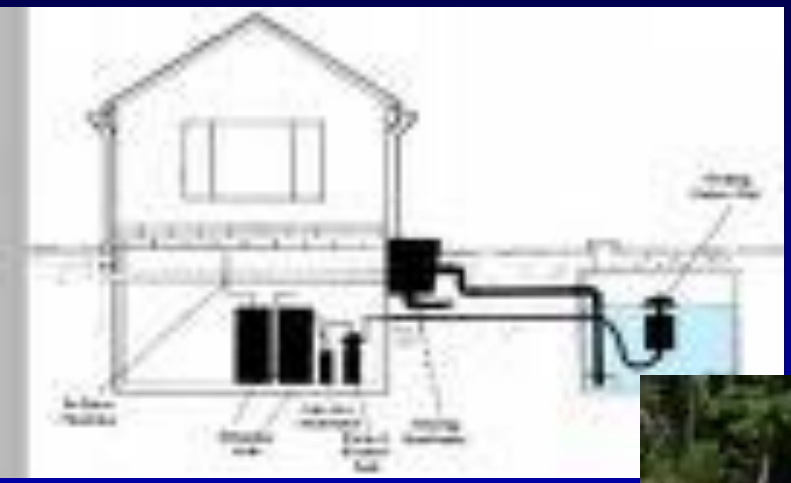
- 15 connections/25 or more persons
- **Serves people who pass by**
- 84,149 TNCWS served 13.6 million people
- 2,010 systems relied on surface water, serving 2,534,900 people
- 82,126 systems relied on ground water, serving 11 million people

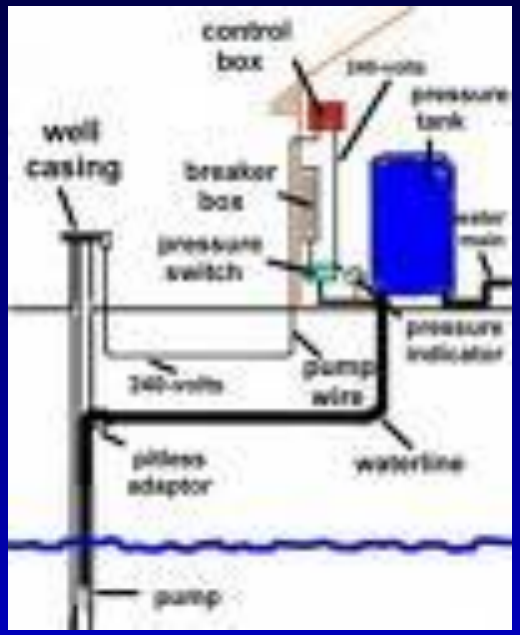
Transient Non-Community Water Systems (NTNCWS)

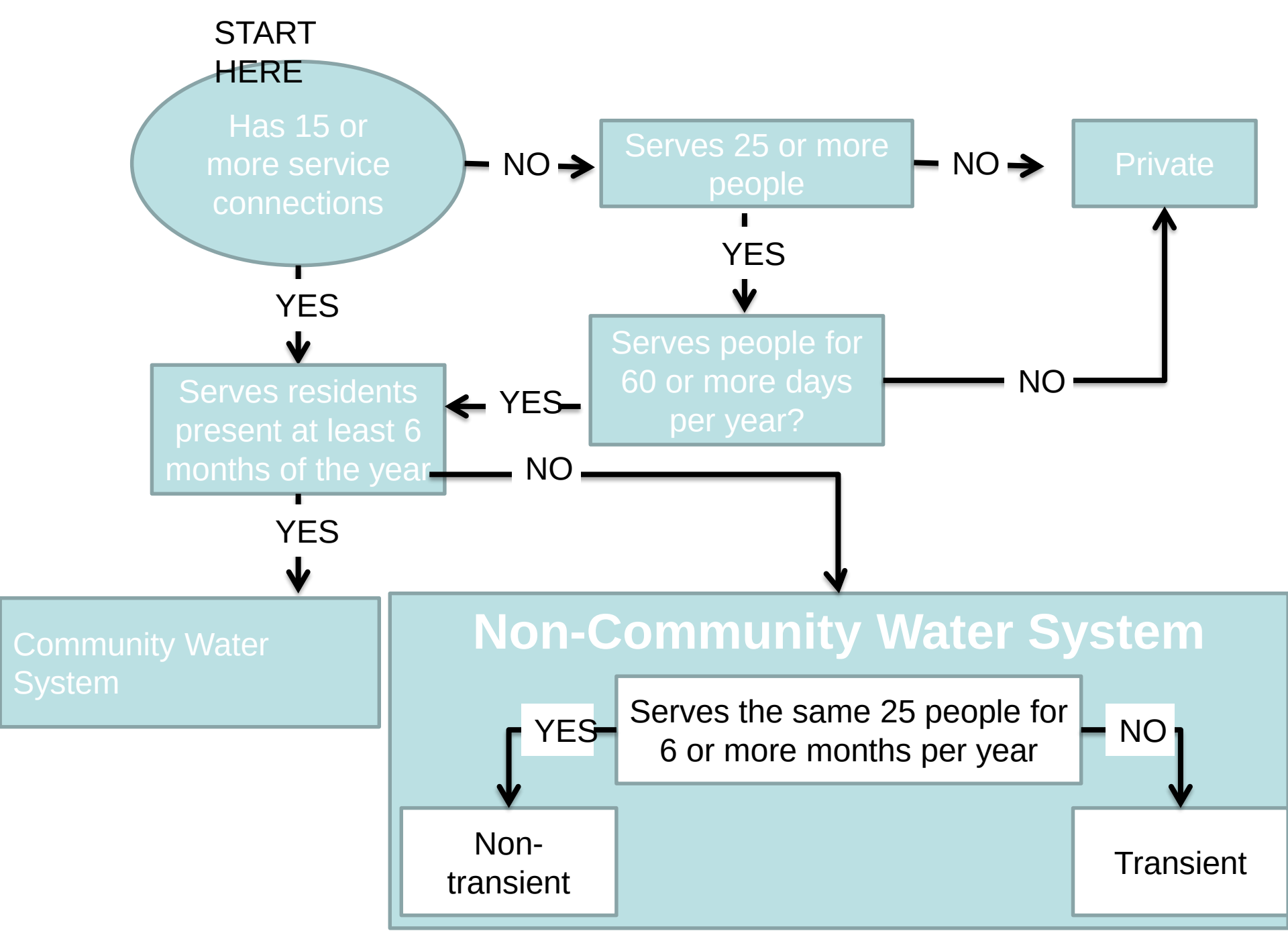
- Some rural Motels, Parks, Churches, Restaurants

Not Considered Public Water Systems

- **Private homes/well systems**






START HERE
Has 15 or more service connections
NO
Serves 25 or more people
NO
Private
YES
YES
Serves people for 60 or more days per year?
NO
YES
Serves residents present at least 6 months of the year
NO
YES
Community Water System
Non-Community Water System
YES
Serves the same 25 people for 6 or more months per year
NO
Non-transient
Transient

Community Water Systems: X-Conn

10. In community water systems (**CWS**), water suppliers shall implement a cross connection control program directly, or by written agreement with another agency experienced in cross connection control. The local cross connection program shall consist of the following elements:
    a. Local ordinance or enabling authority that authorizes discontinuing water service to premises for: OAR 333-061-0070 Page 3 of 10 Effective April 1, 2016
        A. Failure to remove or eliminate an existing unprotected or potential cross connection;
        B. Failure to install a required approved backflow prevention assembly;
        C. Failure to maintain an approved backflow prevention assembly; or
        D. Failure to conduct the required testing of an approved backflow prevention assembly.

Community Water Systems: X-Conn

10. In community water systems (**CWS**), water suppliers shall implement a cross connection control program directly, or by written agreement with another agency experienced in cross connection control. The local cross connection program shall consist of the following elements:

    b. A written program plan for **community water systems** with 300 or more service connections shall include the following:
        A. A list of premises where health hazard cross connections exist, including, but not limited to, those listed in Table 42 (Premises Requiring Isolation);
        B. A current list of certified cross connection control staff members;
        C. Procedures for evaluating the degree of hazard posed by a water user's premises;
        D. A procedure for notifying the water user if a non-health hazard or health hazard is identified, and for informing the water user of any corrective action required;
        E. The type of protection required to prevent backflow into the public water supply, commensurate with the degree of hazard that exists on the water user's premises, as defined in Table 43 (Backflow Prevention Methods);
        F. A description of what corrective actions will be taken if a water user fails to comply with the water supplier's cross connection control requirements;
        G. Current records of approved backflow prevention assemblies installed, inspections completed, backflow prevention assembly test results on backflow prevention assemblies and verification of current Backflow Assembly Tester certification; and
        H. A public education program about cross connection control.

Community Water Systems: X-Conn

10. In community water systems (**CWS**), water suppliers shall implement a cross connection control program directly, or by written agreement with another agency experienced in cross connection control. The local cross connection program shall consist of the following elements:

    c. The water supplier shall prepare and submit a cross connection control Annual Summary Report to the Authority, on forms provided by the Authority, before the last working day of March each year.

    d. In community water systems having **300 or more service connections, water suppliers shall ensure at least one person is certified as a Cross Connection Control Specialist**, unless specifically exempted from this requirement by the Authority.

11. Fees: Community water systems shall submit to the Authority an annual cross connection program implementation fee, based on the number of service connections, as follows: Service Connections — Fee: 15-99 — $30. 100-999 — $75. 1,000-9,999 — $200. OAR 333-061-0070 Page 4 of 10 Effective April 1, 2016 10,000 or more — $350.

TNCWS or NTCWS: X-Conn

12. In transient or non-transient non-community water systems, the water supplier that owns or operates the system shall:

    a. Ensure no cross connections exist, or are isolated from the potable water system with an approved backflow prevention assembly, as required in section (13) of this rule;

    b. Ensure approved backflow prevention assemblies are installed at, or near, the cross connection; and

    c. Conduct an annual cross connection survey and inspection to ensure compliance with these rules, and test all backflow assemblies annually. All building permits and related inspections are to be made by the Department of Consumer and Business Services, Building Codes Division, as required by ORS 447.020.

Cross Connection Control Requirements

13. Approved backflow prevention assemblies and devices required under these rules shall be approved by the University of Southern California, Foundation for Cross Connection Control and Hydraulic Research, or other equivalent testing laboratories approved by the Authority.

http://fccchr.usc.edu/

14. Backflow prevention assemblies installed before the effective date of these rules that were approved at the time of installation, but are not currently approved, shall be permitted to remain in service provided the assemblies are not moved, the piping systems are not significantly remodeled or modified, the assemblies are properly maintained, and they are commensurate with the degree of hazard they were installed to protect. The assemblies must be tested at least annually and perform satisfactorily to the testing procedures set forth in these rules. (14)

Cross Connection Control Requirements

15. Tests performed by Authority-certified Backflow Assembly Testers shall be in conformance with procedures established by the University of Southern California, Foundation for Cross Connection Control and Hydraulic Research, Manual of Cross-Connection Control, 10th Edition, or other equivalent testing procedures approved by the Authority.

16. Backflow prevention assemblies shall be tested by Authority-certified Backflow Assembly Testers, except as otherwise provided for journeyman plumbers or apprentice plumbers in OAR 333-061-0072 of these rules (Backflow Assembly Tester Certification). The Backflow Assembly Tester must produce three copies of all test reports. One copy must be maintained in the Tester's permanent records, one copy must be provided to the water user or property owner, and one copy must be provided to the water supplier.
    a. Test reports must be provided within 10 working days; and OAR 333-061-0070 Page 5 of 10 Effective April 1, 2016
    b. The test reports must be in a manner and form acceptable to the water supplier.

Cross Connection Control Requirements

17. All approved backflow prevention assemblies subject to these rules shall be installed in accordance with OAR 333-061-0071 and the Oregon Plumbing Specialty Code. (17)

18. The Authority shall establish an advisory board for cross connection control issues consisting of not more than nine members, and including representation from the following:
    a) Oregon licensed Plumbers;
    b) Authority certified Backflow Assembly Testers;
    c) Authority certified Cross Connection Specialists;
    d) Water Suppliers;
    e) The general public;
    f) Authority certified Instructors of Backflow Assembly Testers or Cross Connection Specialists;
    g) Backflow assembly manufacturers or authorized representatives;
    h) Engineers experienced in water systems, cross connection control or backflow prevention; and
    i) Oregon certified Plumbing Inspectors.

Oregon Cross Connection Control Regulations OARS 333-061-0070-73

A. Specialist Control Requirements OAR333-061-0070-0073

- ~~333-061-0070 Cross Connection Control Requirements~~
- **333-061-0071 Backflow Prevention Assembly Installation and Operation Standards**
- 333-061-0072 Backflow Assembly Tester Certification
- 333-061-0073 Cross Connection Specialist Certification

Backflow Prevention Assembly Installation and Operation Standards Backflow Prevention Assembly Installation and Operation Standards

1. Any approved backflow prevention assembly required by OAR 333-061-0070 shall be installed in a manner that:

    a. Facilitates its proper operation, maintenance, inspection, and in-line testing using standard installation procedures approved by the Authority, such as, but not limited to, University of Southern California, Manual of CrossConnection Control, 10th Edition, the Pacific Northwest Section American Water Works Association, Cross Connection Control Manual, 7th Edition, or the local administrative authority having jurisdiction;

    b. Precludes the possibility of continuous submersion of an approved backflow prevention assembly, and precludes the possibility of any submersion of the relief valve on a reduced pressure principle backflow prevention assembly; and
    c. Maintains compliance with all applicable safety regulations and the Oregon Plumbing Specialty Code.

Backflow Prevention Assembly Installation and Operation Standards Backflow Prevention Assembly Installation and Operation Standards

2. For premises isolation installation:
   a) The approved backflow prevention assembly shall be installed at a location adjacent to the service connection or point of delivery; or OAR 333-061-0071 Page 7 of 10 Effective April 1, 2016
   b) Any alternate location must be with the advance approval of the water supplier and must meet the water supplier's cross connection control requirements; and
   c) The premises owner shall ensure no cross connections exist between the point of delivery from the public water system and the approved backflow prevention assembly.

3. Bypass piping installed around any approved backflow prevention assembly must be equipped with an approved backflow prevention assembly to:
   a) Afford at least the same level of protection as the approved backflow prevention assembly being bypassed; and
   b) Comply with all requirements of these rules.

Backflow Prevention Assembly Installation and Operation Standards Backflow Prevention Assembly Installation and Operation Standards

4. All Oregon Plumbing Specialty Code approved residential multi-purpose fire suppression systems constructed of potable water piping and materials do not require a backflow prevention assembly.

5. Stand-alone fire suppression systems shall be protected commensurate with the degree of hazard, as defined in Table 43 (Backflow Prevention Methods).

6. Stand-alone irrigation systems shall be protected commensurate with the degree of hazard, as defined in Table 43 (Backflow Prevention Methods).