

CROSS CONNECTION CONTROL TWO-DAY TESTER RETRAIN/RENEWAL

(New Course Waiting For OK)

[See documents for this course](#)

Course Title CROSS CONNECTION CONTROL TWO-DAY TESTER RETRAIN/RENEWAL	OnsiteOandM CEUs 0	ContactZip 97045	HomeStudy no
Target Audience DWP 1.2	MaxCEUs 1.2	CurrentContactPhone 503-594-3148	Recurring yes
Instructor Matt LaForce/Jim Nurmi	Fees Charged 190	CurrentContactFax 	URL https://ccc-wet.eventbrite.com/
Training Location CCC Oregon City Campus	Fees Paid 190.00	CurrentContactEmail amber.steele@clackamas.edu	Add this sponsor to Sponsors Table? <input type="checkbox"/>
Dates Various Dates, TH-F	CurrentContactName Matt LaForce		Does Course Promote a Product? no
DWP CEUs 1.2	Business Name Clackamas Community College		BetaTested NA
WW CEUs 0	ContactAddress 19600 Molalla Avenue		
OnsiteInstall CEUs 0	ContactCity Oregon City		
	ContactState OR		

Comments

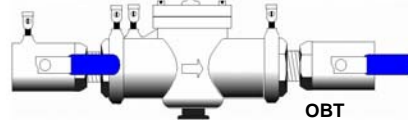
This renewal course will provide ample time to practice your assembly testing skills on all approved backflow assemblies. Practice assemblies (both vertical and horizontal) with gauges and simulators will be available. Interactive clicker lecture with 10th edition assembly testing and troubleshooting procedures, followed by a written exam. Ample time was provided for hands-on assembly practice. On day two hands-on testing will commence. <https://ccc-wet.eventbrite.com/>

SponsorID 13	Sponsor's Address 19600 Molalla Avenue	Sponsor's Zipcode 97045	Sponsor's Name Matt LaForce
Sponsor's Business Name Clackamas Community College	Sponsor's City Oregon City	Sponsor's Phone (503) 549-3345	Sponsor's Email amber.steele@clackamas.edu
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**Backflow Tester Re-certification
2-day Renewal Course
(OAR 333-061-0074)**

Oregon Backflow Training OBT



*“The **First** State of Oregon Recognized Backflow Training Program with over 27 years of **Superior** training!!”*

503-594-3345

<http://depts.clackamas.cc.or.us/wet/obt-summary.htm>



**Two-Day Tester Recertification
Schedule
1.4 CEUs**

Day 1

8:00-10:00 – **(0.2 CEU)**

- ◆ Review cross connection requirements as outlined in OAR 333-061-0070
- ◆ Review cross connection hazards and methods of protection
- ◆ Review installation standards for backflow assemblies
- ◆ Review assembly approved requirements
- ◆ Review safety for testers and OSHA regulations

10:00-10:10 Break

10:10-12:00 **(0.2 CEU)**

Individual evaluation and retention of pertinent backflow criteria necessary to be recertified in accordance with OAR 333. Standard practices, State and OSHA regulations, safety and device installation are all included in this evaluation.

12:00-12:30 Lunch

12:30-2:45 **(0.2 CEU)**

Lecture Review of Problems Associated with

- ◆ Lecture and demonstration of Reduced Pressure Backflow Assemblys (RPBA)
A review of problems associated with RPBA in accordance with OARS using the 10 edition procedures from the Foundation of Cross-Connection Control and Hydraulic Research (FCCHR) from USC is emphasized.

2:45-3:00 Break

3:00-4:00 Lecture and demonstration of Double Check Valve Assembly (DCVA) competency on: **(0.1 CEU)**

- ◆ Lecture Review of Problems Associated with Double Check Valve Assembly (DCVA)
A review of problems associated with DCVA in accordance with OARS using the 10 edition procedures from the Foundation of Cross-Connection Control and Hydraulic Research (FCCHR) from USC is emphasized.

CLASS ENDS AT 4 pm

Total 0.7 CEUS

Day 2

8:00-10:00 – **(0.2 CEU)**

◆ Lecture Review of Problems Associated with Pressure Vacuum Breaker Assembly (PVBA)
A review of problems associated with PVBA in accordance with OARS using the 10 edition procedures from the Foundation of Cross-Connection Control and Hydraulic Research (FCCHR) from USC is emphasized.

10:00-10:10 Break

10:10-12:00 **(0.2 CEU)**

◆ Lecture Review of Problems Associated with Spill Resistant Vacuum Breaker Assembly (SVBA)
A review of problems associated with SVBA in accordance with OARS using the 10 edition procedures from the Foundation of Cross-Connection Control and Hydraulic Research (FCCHR) from USC is emphasized.

12:00-12:30 Lunch

12:30-2:45 **(0.2 CEU)**

Validation of competency on:

- ◆ Reduced Pressure Backflow Assembly (RPBA)
- ◆ Double Check Valve Assembly (DCVA)

The competency of individual licensed backflow assembly tester's is evaluated. This first evaluation is on both the RPBA and DCVA in accordance with OARS using the 10 edition procedures from the Foundation of Cross-Connection Control and Hydraulic Research (FCCHR) from USC.

2:45-3:00 Break

3:00-4:00 Validation of competency on: **(0.1 CEU)**

- ◆ Pressure Vacuum Breaker Assembly (PVBA)
- ◆ Spill-Resistance Vacuum Breaker Assembly (SVBA)

The competency of individual licensed backflow assembly tester's is evaluated. This evaluation is on both the PVBA and SVBA in accordance in accordance with OARS using the 10 edition procedures from the Foundation of Cross-Connection Control and Hydraulic Research (FCCHR) from USC.

◆ Award OHA backflow certificates electronically after student completion of written exam (70% pass rate) and the validation of assembly testing procedures (90%).

CLASS ENDS AT 4 pm

Total 1.4 CEUS

**Backflow Tester Re-certification
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(OAR 333-061-0074)**

Oregon Backflow Training OBT

*"The **First** State of Oregon Recognized
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503-657-6958 X2388

<http://depts.clackamas.cc.or.us/wet/obt-summary.htm>



Objectives

1. Understand Requirements for Completion of Renewal Process
2. Understand the role of being a safe tester in the State of Oregon
3. Understand hands on (USC 9th edition CCM) and written OAR (333-061-0070 through 333-061-0073) for function/test procedure/installation of backflow prevention assemblies.

**Oregon Administrative Rules
(OAR)**

Tester Certification Renewal (333-061-0071 to 333-061-0073)

- A. **0.5 CEU of Training**
- Backflow Assembly Installation/Operation
 - Hands on demonstration of test procedures
****USC 9th EDITION***
 - Diagnosis of two failure conditions for each device
 - Review Backflow Tester Safety Issues
- B. 75% score on 33 question exam
- C. 90% score on hands on exam

**Oregon Administrative Rules
(OAR- 333-061-0072)**

- **Proof of yearly test gauge calibration will be required for certification renewal** (333-061-0072).
- **All test gauges shall be tested for accuracy and calibrated once every twelve months, in the same month every year, as determined by the Backflow Assembly Tester**
- **Differential Pressure Gauge!**
- **Dual water column test**

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

1. RPBA's
2. DCVA's
3. PVBA's
4. All of the above

Verification of gauge accuracy is good for:

1. 12 months
2. The life of the gauge
3. Two years
4. Gauges in Oregon do not need to be calibrated

ROLE OF A TESTER?

A. When do you test a assembly (33-061-0070)?
 -Annually, at time of installation, after repair, or relocation, if water purveyors insists, after backflow incident

B. When do you repair a assembly?
BE CAREFUL!!! TALK WITH WATER PURVEYOR!!
 -REPAIR IS HANDLED BY: Journeyman plumber **or**
 -Install and repair can be handled by a landscape construction professional that has an irrigation plus backflow license and the individual responsible for repair has a current DHS tester certification card (M. Snyder, 4/7/09).
 -Install and repair can also be handled by a landscape construction professional with an ALL PHASE plus backflow license (note: the individual responsible for repair must have a current DHS tester card) (M. Snyder, 4/7/09).
 -Landscape construction professional must either own or be employed by a licensed landscape contracting business (contractor) (M. Snyder, 4/7/09) .
 -Legislative Draft proposal for A Specialty Plumbers License for a tester to repair

ROLE OF A TESTER?

WATER PURVEYOR= GOOD PAPERWORK!

C. Enforcement of Cross Connection Regulations = Water Supplier

E. How can a tester lose his/her license (OAR 333-061-0072)?
 -Falsifying a report,
 -False information,
 -Lost license in another state,
 -Failed to properly test an assembly,
 -Let someone test using their card
 -No longer have a valid Construction Contractor's Board registration or a Landscape Contractor's Board license(ORS-448.279)
 -Using a non calibrated gauge

What are the primary responsibilities of the backflow assembly tester?

1. Only certified individuals can test backflow assemblies
2. Fill out and complete test reports w/in 10 days to water purveyor (OAR)
3. Repairs may now be handled by journeyman plumbers or a licensed landscape professional with a backflow license
4. All of the above

Which of the following is not testable?

1. Pressure Vacuum Breaker Assembly
2. Double Check Valve Assembly
3. Reduced Pressure Backflow Assembly
4. Atmospheric Vacuum Breaker Device

Who is responsible for monitoring/inspecting backflow preventers on public water systems?

1. Oregon DHS
2. Plumbing inspector
3. Local water supplier
4. Fire marshall

As a tester you encounter a leaky #1 and leaky #2 check of an RP Device. You should?

1. Repair the device within 5 days
2. Repair the device within 30 days
3. Repair the device before its next annual test cycle
4. Talk with the purveyor and determine what their ordinance states.

**According to OAR (333-061-007);
What edition of the USC
Foundation For Cross Connection
Control Manual is used for hands
on testing procedures ?**

1. 5th, 6th, 7th or 8th edition
2. 7th edition
3. 8th edition
4. 9th edition

**How long does a tester have to
hand in a tester report to a water
purveyor?**

1. Within 10 days
2. After 30 days
3. After 6 months
4. After 8 months

Key Words Backflow

1. **Backflow-** means the flow of water or other liquids, mixtures, or substances into the distributing pipes of a potable supply of water from any sources other than its intended source, and is caused by backsiphonage or backpressure. Refers to the flow produced by the differential pressure existing between two systems both of which are at pressures greater than atmospheric
2. **Backpressure-** is the reversal of normal flow in a system due to an increase in the downstream pressure above that of the supply pressure.
3. **Backsiphonage** means a drop in distribution system pressure below atmospheric pressure (partial vacuum), that would cause, or tend to cause, water to flow opposite of its intended direction.

Backflow

Backpressure-

- Elevated Piping
- Potable Water connections to pumps:
Discharge side of pump
- Thermal Expansion-Boilers.

Backsiphonage-

- Elevated Piping- water main break, Fire Fighters
- Potable Water connections to pumps:
Suction side of pump
- Venturi Effect

**Backpressure can be caused by
elevated piping, the discharge
side of a pump and thermal
expansion?**

1. True
2. False

**Backsiphonage can be caused by
elevated piping, the suction side of
a pump or the Venturi effect?**

1. True
2. False

Backflow Assemblies

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

7. **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,

Make, model, orientation, and size listed by DHS

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

A manufacturer states that their new RP assembly is approved for vertical installation, you can install it in the State of Oregon?

1. True
2. False

A backflow device can be testable?

1. True
2. False

A backflow assembly is testable?

1. True
2. False

Dukes of Hazard

The degree of hazard dictates what assembly is to be installed.

Low Hazard/pollutant/non-health

Fire systems (w/out chemical injection), irrigation systems, hose bibs, etc (DHS, pg 30).

High hazard/contaminant/health

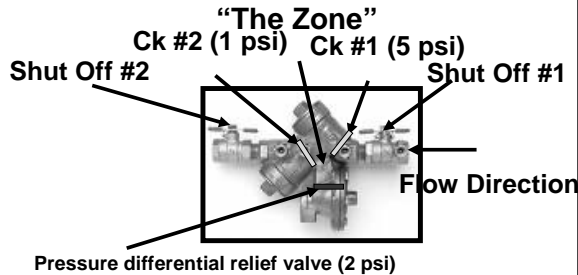
•Car wash, mortuary, chemical plants, laboratories, wastewater plants, etc (DHS, pg 29).

Reduced Pressure Backflow Assemblies

Definition means an assembly containing two independently acting approved check valves, together with a hydraulically operating, mechanically independent pressure differential relief valve located between the check valves and at the same time below the first check valve. The unit shall include properly located resilient seated test cocks and tightly closing resilient seated shutoff valves at each end of the assembly. This assembly is designed to protect against a non-health hazard or a health hazard.

Reduced Pressure Backflow Assemblies

Parts and Components Two spring loaded approved check valves separated by a pressure differential relief valve installed between two shutoff valves.



Reduced Pressure Principle Backflow Prevention Assembly (RP)

- Installation**
- a) Shall conform to bottom and side clearances when the assembly is installed inside a building. Access doors may be provided on the side of an above-ground vault;
 - b) Shall always be installed horizontally, never vertically, unless the assembly is specifically approved for vertical installation by the Foundation;
 - c) Shall always be installed above the 100-year (1%) flood level unless approved by the appropriate local administrative authority having jurisdiction;
 - d) Shall never have extended or plugged relief valves;
 - e) Shall be protected from freezing when necessary;
 - f) Shall be provided with a 12" approved air gap drain;
 - g) Shall not be installed in an enclosed vault or box unless a bore-sighted drain to daylight is provided;



Reduced Pressure Principle Backflow Prevention Assembly (RP)

Installation

(h) May be installed with reduced clearances if the pipes are 2 inches in diameter or smaller, are accessible for testing and repairing, and approved by the appropriate local administrative authority having jurisdiction;

(i) Shall not be installed at a height greater than 5 feet unless there is a permanently installed platform meeting Oregon Occupational Safety and Health Administration (OR-OSHA) standards to facilitate servicing the assembly;

Reduced Pressure Principle Backflow Prevention Assembly (RP)

Protection

•non-health (low) hazard or health (high) hazard

Conditions

•backsiphonage or backpressure conditions.

Simplified RP Test Procedure

1. Close ALL Gauge Knobs then Flush Test Cocks (Leave Open TC#4 then 1,2,3)
2. Hook-up Gauge (R2D2) and Bleed
3. Close #2 Shut-off; Look at Gauge **"IS CHECK #1 HOLDING"**
4. Perform Test #1 OF Relief Valve (Record Reading)
5. Bleed Vent Hose; Hook-up Vent Hose and BLEED Gauge (re-establish the zone)
6. Perform Test #2 **"BIG EVENT"** Check #2 (record tight or leak)
7. Re-Establish Zone
8. Read and Record Check #1

The purpose of the number one test on an RP assembly is to:

1. determine the zone differential pressure drop
2. determine the proper operation of the differential pressure relief valve
3. determine the proper operation of the number 1 check
4. determine the proper operation of the number 2 check

Which of the following gauge readings indicates failure of the relief valve when testing?

1. 3.8 psid
2. 1.5 psid
3. 2.0 psid
4. 6.0 psid

Shut-off valves #1 and #2 are closed in order to properly test an RP ?

1. True
2. False

When testing the RPBA a leaking #2 shut-off with flow through the assembly will:

1. Make it difficult to dump/test the relief valve
2. Require a bypass/jumper hose to be used
3. Cause the apparent drop across the #1 check to be inaccurate
4. All of the above

A steady discharge of water from the relief valve of a RP assembly can be a defect in the first check or in the relief valve or backpressure backflow occurring through a leaking second check valve?

1. True
2. False

An RP assembly is constantly discharging from the relief port. What is the proper response?

1. Faulty #2 check w/ backpressure—Close #2 shutoff.
2. Faulty #1 Check-Open test cock #4. (drip go away?)
3. Faulty relief valve (still dripping after #1 and #2 above)
4. If #2 Shut OFF Leaks-Hook Jumper TC#1 to TC#4
-CREATE CROSS CONNECTION-DANGEROUS!
Get In Get Out!
-Hook up gauge and ASSESS (NOT TEST)
-Relief valve, check #1, check #2

Back pressure during test 2. The test gauge reading is observed to go up when the bypass needle valve is opened.
-RECORD the #2 check as tight, and the #1 check as tight, and record the observed #1 check pressure drop

If when you Close Shut Off #2, Check one “DOES NOT HOLD”. What do you do?

-“I cannot complete the test on the assembly”
-Can get Approximate Relief Valve Opening Point
If test #1 fails on the RP assembly do you stop your test procedure?
-No “I CAN KEEP GOING” you can still get good data

If test #2 of the #2 check fails. Do you need to check it twice?
-HELL YES!!—IT MAYBE DISC COMPRESSION!

If test #2 of the #2 check fails, you can accurately perform a test #3 of the number one check?

-No WAY!--LIABILITY

If check valve number one on a reduced pressure principle backflow prevention assembly is leaking, you can complete the test on that assembly ?

- 1. True
- 2. False

Can an RP assembly with a number 2 check that has failed twice be considered passable?

- 1. yes
- 2. no

If the #2 check fails during test #2 on an RP you must check it **twice** (may have disc compression)!!!!!!!!!!

- 1. True
- 2. False

A number 2 check has the heaviest spring in an RP?

- 1. True
- 2. False

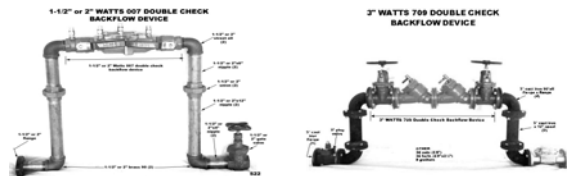
An RP must have 12 inches of clearance below the relief valve?

- 1. True
- 2. False

A Double Check Valve Backflow Prevention Assembly (DC)

Definition means an assembly of two independently acting approved check valves, including tightly closing resilient seated shutoff valves attached at each end of the assembly and fitted with properly located resilient seated test cocks. This assembly is designed to protect against a non-health hazard.

Parts and Components Two spring loaded or weighted approved check valves installed between two shutoff valves.



A Double Check Valve Backflow Prevention Assembly (DC)

Installation

- (a) Shall conform to bottom and side clearances when the assembly is installed inside a building;
- (b) May be installed vertically as well as horizontally provided the assembly is specifically listed for that orientation in the Department's Approved Backflow Prevention Assembly List.
- (c) May be installed below grade in a vault, provided that water-tight fitted plugs or caps are installed in the test cocks, and the assembly shall not be subject to continuous immersion;
- (d) Shall not be installed at a height greater than 5 feet unless there is a permanently installed platform meeting (OR-OSHA) standards to facilitate servicing the assembly;

A Double Check Valve Backflow Prevention Assembly (DC)

Installation

- (e) May be installed with reduced clearances if the pipes are 2 inches in diameter or smaller, provided that they are accessible for testing and repairing, and approved by the appropriate local administrative authority having jurisdiction;
- (f) Shall have adequate drainage provided except that the drain shall not be directly connected to a sanitary or storm water drain.
- (g) Shall be protected from freezing when necessary

A Double Check Valve Backflow Prevention Assembly (DC)

Protection

•non-health (low) hazard only!!!

Conditions

•backsiphonage or backpressure conditions.

Simplified DCVA Test Procedure

1. Close ALL Gauge Knobs then Flush Test Cocks
2. Sight Tube to TC #3 (Fill)
3. Hook-up Red Hose & Bleed Valve (TC#2) /Bleed Gauge
4. Close #2 Shut-off; "**Is Gauge at level of assembly?**" Then #1 Shut Off
5. Open TC #3 All the way (Record Check #1 Reading)
6. OPEN SO #1
7. Move Sight Tube to TC #4 (Fill)
8. Hook-up Red Hose & Bleed Valve (TC#3)/Bleed Gauge
9. "**IS Gauge at level of assembly?**"; Close #1 Shut-off
10. Open TC #4 All the way (Record Check #2 Reading)

OBT: Rule of Thumb for a Double Check Valve Backflow Prevention Assembly (DC) Test

Rule #1

•When you touch any shutoff valve have the gauge at the proper location!

Rule #2

•Before you touch the bleed valve arrangement record a value.

Rule #3

•Water drops down and out of the sight tube, remove the sight tube and take the reading.

During the #1 test on a double check valve assembly, the following conditions occur. What is the proper response?

- a. Flow from the #3 test cock sight tube can be adjusted to a slight drip. -leaky #1 shutoff
- b. Flow from the #3 test cock sight tube cannot be adjusted to a slight drip. -Excessive shutoff leaks (maybe shutoff #1 or #2)
- c. Flow stops from the bleed valve, but continues from the sight tube. -use that recorded value!!!
- d. Water recedes from the #3 test cock sight tube. -take away the sight tube and lower the gauge to the test cock/centerpoint of assembly level.... shut off #2 is leaking out the backside

A DCVA works well against backpressure and backsiphonage and high hazard conditions?

1. True
2. False

A double check valve assembly backflow preventer is tested with only the number two shut-off valve closed ?

1. True
2. False

A leak in the #1 check valve of a DCVA will?

1. Water can be removed with a bleed valve
2. Cause a higher gauge reading
3. Water flows from the sight tube
4. All of the above

Install a bleed valve as part of the test procedure when testing a double check valve assembly?

1. True
2. False

What do you do if you are testing a vertical 6" DCVA and the water recedes during the #2 test on the second check

1. Fail the assembly, the #2 s/off is leaking.
2. Use the reading on the gauge as the #2 check value.
3. Remove sight tube and lower the gage to the centerline of the check.
4. Fail the #2 check.

Atmospheric Vacuum Breaker (AVB)

Definition- means a non-testable device consisting of an air inlet valve or float check, a check seat and an air inlet port. *This device is designed to protect against a non-health hazard or a health hazard under a backsiphonage condition only*

Parts and Components One atmospheric vent valve.



Atmospheric Vacuum Breaker (AVB)

Installation

- (a) Have absolutely no shut-off valves on the downstream or discharge side of the atmospheric vacuum breaker;
- (b) Not be installed in dusty or corrosive atmospheres;
- (c) Not be installed where subject to flooding;
- (d) Be installed a minimum of 6 inches above the highest downstream piping and outlets;
- (e) Be used intermittently;
- (f) Have product and material approval under the Oregon Plumbing Specialty Code for non-testable devices.
- (g) Not be pressurized for more than 12 hours in any 24-hour period: and

Atmospheric Vacuum Breaker (AVB)

Protection

- non-health (low) hazard or health (high) hazard

Conditions

- Be used to protect against backsiphonage only, not backpressure.

An atmospheric vacuum breaker is a testable device in the 9th edition?

- 1. True
- 2. False

An atmospheric vacuum breaker must be installed six inches above the downstream shut-off valve ?

- 1. True
- 2. False

An atmospheric vacuum breaker must be installed six inches above the highest piping of the system (to prevent against backpressure) ?

- 1. True
- 2. False

Why do we install an AVB or a PVB at the highest point of use?

- 1. Keep it away from backpressure from elevated piping
- 2. Keep water from spilling onto lower pipes
- 3. Because the Foundation tests it under these conditions
- 4. All of the above

Its okay to install an AVB in a closed room with a toxic (corrosive gas) like chlorine?

1. True
2. False

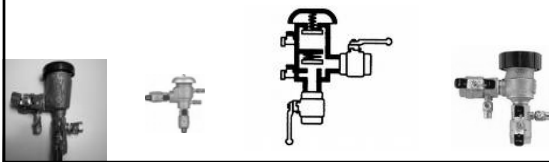
An atmospheric vacuum breaker can function properly if it is under pressure for no more then _____ hrs in a day.

1. 6 hrs
2. 12 hrs
3. 18 hrs
4. 24 hrs

Pressure Vacuum Breaker (PVB)

Definition- means an assembly consisting of an independently operating, internally loaded check valve and an independently operating loaded air inlet valve located on the discharge side of the check valve. This assembly is to be equipped with properly located resilient seated test cocks and tightly closing resilient seated shutoff valves attached at each end of the assembly. This assembly is designed to protect against a non-health hazard or a health hazard under backsiphonage conditions only.

Parts and Components One spring loaded check valve and an atmospheric vent.



Pressure Vacuum Breaker (PVB)

Installation

- (a) Be installed where occasional water discharge from the assembly caused by pressure fluctuations will not be objectionable;
- (b) Have adequate spacing available for maintenance and testing;
- (c) Not be subject to flooding;
- (d) Be installed a minimum of 12 inches above the highest downstream piping and outlets;

Pressure Vacuum Breaker (PVB)

Protection

•non-health (low) hazard or health (high) hazard

Conditions

- Have absolutely no means of imposing backpressure by a pump or other means. The downstream side of the pressure vacuum breaker backsiphonage prevention assembly or spill-resistant pressure vacuum breaker backsiphonage prevention assembly may be maintained under pressure by a valve
- Be used to protect against backsiphonage only, not backpressure.

A vacuum breaker does not work for backpressure

Simplified PVBA Test Procedure

1. Close ALL Gauge Knobs then Flush Test Cocks
2. Hook-up Red Hose & Bleed Valve (TC#2) /Bleed Gauge
3. Close #2 Shut-off; "Is Gauge at level of assembly?" Then #1 Shut Off
4. Open High side bleed valve less then ¼ turn (record air inlet opening point)
5. State: "THE AIR INLET HAS FULLY OPENED!"
6. OPEN SO #1
7. Hook-up Red Hose & Bleed Valve (TC#1)/Bleed Gauge
8. "Is Gauge at level of assembly?"; Close #1 Shut-off
9. Open TC #2 All the way, Slow drip (Record Check #1 Reading)

A pressure type vacuum breaker works well to protect against backpressure?

1. True
2. False

When performing the #1 test on the Pressure Vacuum Breaker the air inlet opens below 1.0 psid (0.5 psid). Does the assembly pass and if not, what is the likely failure or cause?

1. Cannot determine the pass/fail. SVB's do not have an air inlet valve
2. Passing result. No failure or cause
3. Failing result. The assembly will prevent backpressure
4. Failing result. Likely a dirty or damaged air inlet disc

All reduced pressure principle backflow assemblies, double check valve assemblies, and pressure type vacuum breakers must be tested before they are put to use?

1. True
2. False

It is important to place the gauge at the same level as the assembly when testing the PVBA and DCVA?

1. True
2. False

Summary

Device	High Health Haz	Low Non-Health Haz	Back pressure	Back siphonage	Install	Remark
A/G	X	X	X	X	Twice the diameter, no case less than 1 inch separation	System pressure lost Easily bypassed
RP	X	X	X	X	Above ground, need A/G, space for maintenance	Size hydraulically
DCVA		X	X	X	space for maintenance	Size hydraulically
PVB	X	X		X	12" above highest use, space for maintenance	No backpressure
AVB	X	X		X	6" above highest use, NO SHUT OFF VALVES Allowed Downstream	No backpressure

A/G=Air Gap; RP =Reduced Pressure Backflow Assembly; DCVA=Double Check Valve Assembly; PVB=Pressure Vacuum Breaker; AVB=Atmospheric Vacuum Breaker

Tester's and Safety!

Permit Required Confined Spaces

"A confined space is defined as space that employees can enter, has a limited means of entering and exiting, and is not designed for continuous employee occupancy (OAR 437-00201910.146)"
 *hazardous atmosphere, can trap you=TED KRAUSE

Test before you enter- Before every entry, you must test the atmosphere inside the confined space for oxygen content, flammable gasses and vapors, and any other potential toxic air contaminants.

•Tester Role in Confined Spaces

- Your Life is at Stake---
- IDENTIFY IF IT'S A CONFINED SPACE
- YOU MAY NEED A PERMIT-Get Trained!!

Tester's Role in Safety!

Safety

- CONFINED SPACE ENTRY!**
- First aid
- MSDS reports (hazardous chemicals)
- Electrical Safety
- Lockout-Tagout (LOTO)- is a safety procedure which is used to ensure that dangerous machines are properly shut off and not started up again prior to the completion of maintenance or servicing work (1910.146(c)(7)).

What characteristics define a confined space?

1. Large enough egress to enter
2. Can trap or entrap you
3. Not intended for regular occupancy
4. Use a sensor before entry
5. All of the above

What steps/measurements should ***ALWAYS*** be conducted before entering a confined space?

1. Monitor collect data on the atmosphere of the vault/pit
2. Use a 100 cfm fan blower to ventilate the space
3. Notify OSHA
4. Ensure an attendant is watching



CROSS CONNECTION / BACKFLOW PREVENTION PROGRAM

**OREGON ADMINISTRATIVE RULES
PERMANENTLY ADOPTED
JANUARY 31, 2006***

Relating to

Cross Connection Control

OAR 333-061-0020, 0025, 0030, 0045, 0061, 0065, 0070, 0071, 0072, 0073, 0074,
0090, and OAR 166-200-0110

**DHS DWP Cross Connection Program
PO Box 14450
Portland OR 97293-0450
(971) 673-1220 office
(971) 673-0457 fax
Web site: <http://www.healthoregon.org/crossconnection>**

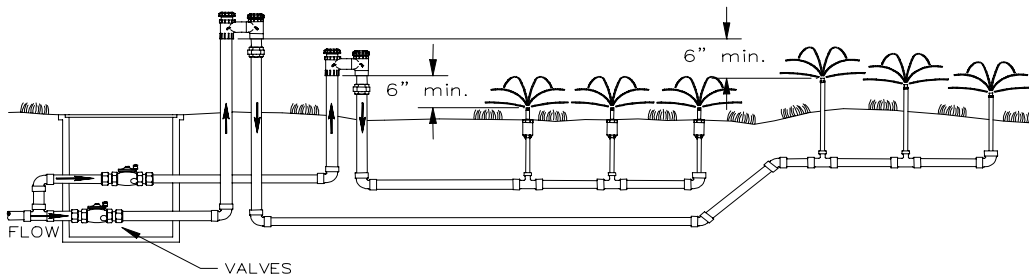
<p style="text-align: center;">TABLE 33 BACKFLOW PREVENTION METHODS USED FOR PREMISE ISOLATION</p>	
<p style="text-align: center;">DEGREE OF IDENTIFIED HAZARD</p>	
<p style="text-align: center;">Non-Health Hazard (Pollutant)</p>	<p style="text-align: center;">Health Hazard (Contaminant)</p>
<p style="text-align: center;">BACKSIPHONAGE OR BACKPRESSURE</p>	<p style="text-align: center;">BACKSIPHONAGE OR BACKPRESSURE</p>
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)	

Statutory Authority: ORS 431 & ORS 448

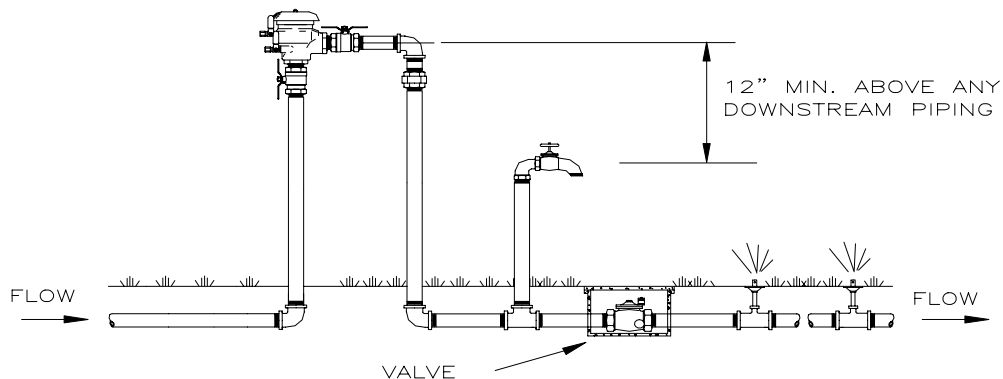
Stats. Implemented: ORS 431.110, ORS 431.150, ORS 448.131, ORS 448.150, ORS 448.268, ORS 448.271, ORS 448.273, ORS 448.279, ORS 448.295 & ORS 448.300

333-061-0071 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 Department, such as, but not limited to, University of Southern California, Manual of Cross-Connection Control, 9th Edition, the Pacific Northwest Section American Water Works Association, Cross Connection Control Manual, 6th 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.
- (2) For premise isolation installation:
 - (a) The approved backflow prevention assembly shall be installed at a location adjacent to the service connection or point of delivery; or
 - (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 premise 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.
- (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 33 (Backflow Prevention Methods).
- (6) Stand-alone irrigation systems shall be protected commensurate with the degree of hazard, as defined in Table 33 (Backflow Prevention Methods).
- (7) An Atmospheric Vacuum Breaker (AVB) shall:

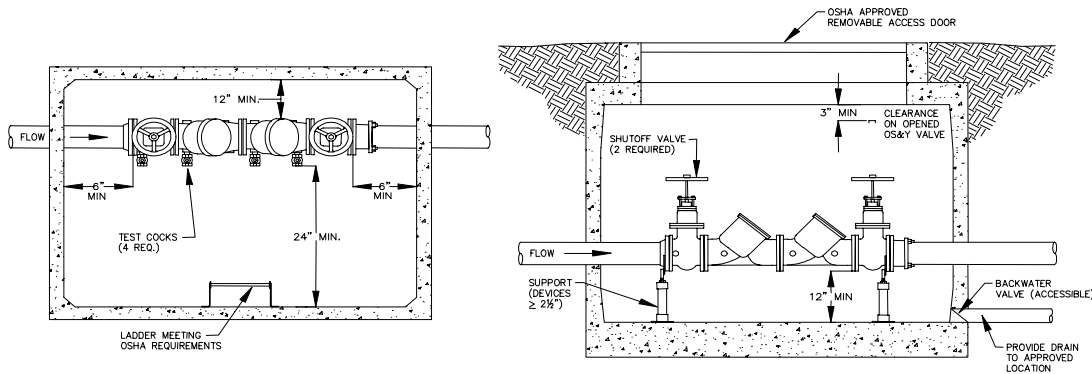


- (a) Have absolutely no means of shut-off on the downstream or discharge side of the atmospheric vacuum breaker;
 - (b) Not be installed in dusty or corrosive atmospheres;
 - (c) Not be installed where subject to flooding;
 - (d) Be installed a minimum of 6 inches above the highest downstream piping and outlets;
 - (e) Be used intermittently;
 - (f) Have product and material approval under the Oregon Plumbing Specialty Code for non-testable devices.
 - (g) Not be pressurized for more than 12 hours in any 24-hour period; and
 - (h) Be used to protect against backsiphonage only, not backpressure.
- (8) A Pressure Vacuum Breaker Backsiphonage Prevention Assembly (PVB) or Spill-Resistant Pressure Vacuum Breaker Backsiphonage Prevention Assembly (SVB) shall:



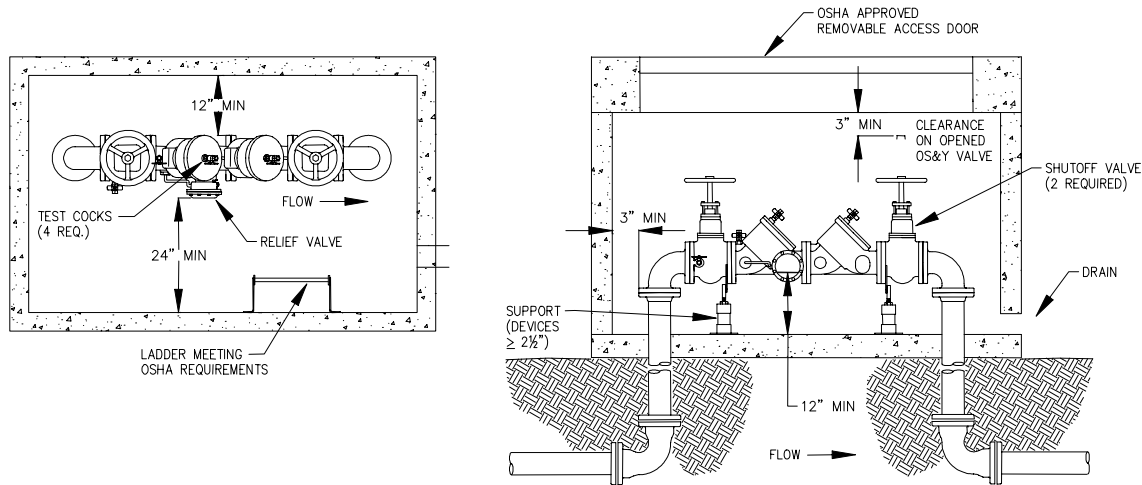
- (a) Be installed where occasional water discharge from the assembly caused by pressure fluctuations will not be objectionable;
- (b) Have adequate spacing available for maintenance and testing;
- (c) Not be subject to flooding;
- (d) Be installed a minimum of 12 inches above the highest downstream piping and outlets;

- (e) Have absolutely no means of imposing backpressure by a pump or other means. The downstream side of the pressure vacuum breaker backsiphonage prevention assembly or spill-resistant pressure vacuum breaker backsiphonage prevention assembly may be maintained under pressure by a valve; and
 - (f) Be used to protect against backsiphonage only, not backpressure.
- (9) A Double Check Valve Backflow Prevention Assembly (DC) or Double Check Detector Backflow Prevention Assembly (DCDA):



- (a) Shall conform to bottom and side clearances when the assembly is installed inside a building;
- (b) May be installed vertically as well as horizontally provided the assembly is specifically listed for that orientation in the Department's Approved Backflow Prevention Assembly List.
- (c) May be installed below grade in a vault, provided that water-tight fitted plugs or caps are installed in the test cocks, and the assembly shall not be subject to continuous immersion;
- (d) Shall not be installed at a height greater than 5 feet unless there is a permanently installed platform meeting Oregon Occupational Safety and Health Administration (OR-OSHA) standards to facilitate servicing the assembly;
- (e) May be installed with reduced clearances if the pipes are 2 inches in diameter or smaller, provided that they are accessible for testing and repairing, and approved by the appropriate local administrative authority having jurisdiction;
- (f) Shall have adequate drainage provided except that the drain shall not be directly connected to a sanitary or storm water drain. Installers shall check with the water supplier and appropriate local administrative authority having jurisdiction for additional requirements;

- (g) Shall be protected from freezing when necessary; and
 - (h) Be used to protect against non-health hazards under backsiphonage and backpressure conditions.
- (10) A Reduced Pressure Principle Backflow Prevention Assembly (RP) or Reduced Pressure Principle-Detector Backflow Prevention Assembly (RPDA):



- (a) Shall conform to bottom and side clearances when the assembly is installed inside a building. Access doors may be provided on the side of an above-ground vault;
- (b) Shall always be installed horizontally, never vertically, unless they are specifically approved for vertical installation;
- (c) Shall always be installed above the 100-year (1%) flood level unless approved by the appropriate local administrative authority having jurisdiction;
- (d) Shall never have extended or plugged relief valves;
- (e) Shall be protected from freezing when necessary;
- (f) Shall be provided with an approved air gap drain;
- (g) Shall not be installed in an enclosed vault or box unless a bore-sighted drain to daylight is provided;
- (h) May be installed with reduced clearances if the pipes are 2 inches in diameter or smaller, are accessible for testing and repairing, and approved by the appropriate local administrative authority having jurisdiction;
- (i) Shall not be installed at a height greater than 5 feet unless there is a permanently installed platform meeting Oregon Occupational Safety and Health Administration (OR-OSHA) standards to facilitate servicing the assembly; and

- (f) Submission of an initial application fee as defined in OAR 333-061-0072(5).
- (3) Requirements for Backflow Assembly Tester certification renewal shall include:
- (a) All Backflow Assembly Tester certificates will expire on June 30 of every odd-numbered year, beginning June 30, 2005. Backflow Assembly Testers can only perform tests if they possess a current, valid certificate;
 - (b) Satisfactory completion of 0.5 CEU in backflow prevention-related fields taken at a Department-approved certification training agency within the 2-year period immediately prior to the date of the certification renewal application;
 - (c) Satisfactory completion of all written and physical-performance examinations, including questions specific to OAR 333-061-0070 through 333-061-0073, administered by a Department-approved certification agency;
 - (A) A minimum score of 75% is required to pass the Department-approved Backflow Assembly Tester written examination;
 - (B) A minimum score of 90% is required to pass the Department-approved Backflow Assembly Tester physical-performance examination; and
 - (C) The Department will make available a list of approved certification training and testing sources.
 - (d) Registration with the Construction Contractor's Board or licensure with the Landscape Contractor's Board, as required by ORS 448.279(2);
 - (e) Submission of yearly test gauge calibration reports performed in the same month every year, as determined by the Backflow Assembly Tester;
 - (f) Submission of a completed renewal application with all required documentation as specified on the renewal application form and in these rules;
 - (g) Submission of a renewal application fee, as defined in OAR 333-061-0072(5);
 - (h) The Department may grant certification renewal without a reinstatement fee for up to 30 days after the expiration date of a certificate. A reinstatement fee of \$50 will be added to the renewal fee for all renewal application fees received after the 30-day period; and
 - (i) A Backflow Assembly Tester who does not renew within 12 months of the expiration date of his or her certificate will be required to meet all requirements of an initial applicant in section (2) of these rules.
- (4) The Department may issue Backflow Assembly Tester certification based on reciprocity if the Department determines the issuing state or entity has

certification training and testing standards and qualifications substantially equivalent to the Department's certification training and testing standards and qualifications, and the applicant/Backflow Assembly Tester meets all requirements set forth in these rules, including:

- (a) Submission of current certification from a state or entity having substantially equivalent certification training and testing standards, as determined by the Department;
 - (b) Submission of attendance and successful completion of an Oregon Department-approved Backflow Assembly Tester certification renewal class, including questions specific to OAR 333-061-0070 through 333-061-0073, within the 12 months prior to submitting the completed reciprocity application;
 - (A) A minimum score of 75% is required to pass the Department-approved Backflow Assembly Tester written examination;
 - (B) A minimum score of 90% is required to pass the Department-approved Backflow Assembly Tester physical-performance examination; and
 - (C) The Department will make available a list of approved certification training and testing sources.
 - (c) Registration with the Construction Contractor's Board or licensure with the Landscape Contractor's Board, as required by ORS 448.279(2);
 - (d) Submission of proof of high school graduation or equivalent;
 - (e) Submission of yearly test gauge calibration reports performed in the same month every year, as determined by the Backflow Assembly Tester;
 - (f) Submission of a completed reciprocity application form with all required documentation as specified on the reciprocity application form and in these rules; and
 - (g) Submission of a reciprocity application fee, as defined in OAR 333-061-0072(5).
- (5) Application fees for Backflow Assembly Tester certification.
- (a) Applicants for certification shall pay an application fee, made payable to the Department of Human Services, Health Services;
 - (b) The Department will not refund any fees once it has initiated processing an application;
 - (c) The application fees are:
 - (A) Initial Certification (2-years) \$70;
 - (B) Certificate Renewal (2-years) \$70;
 - (C) Reciprocity Review \$35 + Initial Certification fee;
 - (D) Reinstatement \$50 + Certificate Renewal fee; and
 - (E) Combination Certificate Renewal \$110.

- (C) Review and discussion of Cross Connection Specialist safety issues.
- (5) Requirements for Backflow Assembly Tester certification renewal shall include:
- (a) A minimum of 0.5 CEU of training, excluding examination time;
 - (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 of approved test procedures for backflow prevention assemblies;
 - (C) Hands-on demonstration of the correct test procedures for each type of backflow prevention assembly;
 - (D) The correct student diagnosis and explanation of two failure and/or abnormal conditions during the hands-on backflow prevention assembly test of each type of backflow prevention assembly;
 - (E) Review and discussion of Backflow Assembly Tester safety issues; and
 - (F) Written examination that includes questions on cross connection control regulations OAR 333-061-0070 through 0073.
 - (c) A minimum score of 75% is required to pass the Department-approved Backflow Assembly Tester written examination; and
 - (d) A minimum score of 90% is required to pass the Department-approved Backflow Assembly Tester physical-performance examination.
- (6) Instructor qualification requirements shall include:
- (a) To be eligible as an instructor for Cross Connection Specialist-initial training or certification renewal course, the following experience in the cross connection control field is required:
 - (A) Must be currently certified as a Cross Connection Specialist in Oregon;
 - (B) Must have 2-years experience in enforcement of cross connection control requirements, or as a certified Cross Connection Specialist, or have related experience, subject to approval by the Department;
 - (C) Must participate in two complete Cross Connection Specialist training courses as a student instructor assigned to teach a portion of the curriculum. A student instructor training program schedule must be submitted to the Department for approval before training begins;

Safety Precautions for Testing in Manholes and Other Confined Spaces

1. TEST THE ATMOSPHERE IN THE CONFINED SPACE AND CAREFULLY REMOVE THE COVER — If possible, test the atmosphere in the confined space BEFORE removing the cover. Explosive chemicals, such as methane, can very easily be ignited by a spark created by removing a manhole cover. NEVER SMOKE AROUND OR IN THE MANHOLE.

Use a screwdriver or hook to remove the manhole lid — NEVER USE FINGERS. Set the cover safely away from the work area and traffic.

2. NOTE THE LOCATION OF THE PIT IN RELATION TO OTHER POSSIBLE SOURCES OF CONTAMINATION — Examples of other sources of contamination: If the pit is downhill from a water treatment plant, chlorine gas from a cylinder leak could be trapped in the pit. Chlorine gas is heavier than air. If the pit is near a landfill, methane gas could be contaminating the vault.

3. NEVER ENTER A PIT WITH STANDING WATER — The water should be pumped out before entry — it is an electrical hazard as well as an avoidable risk. The water could be covering a sink hole which wouldn't be noticed until the water was pumped. In the Oregon accident, both men drown in the standing water after passing out from depleted oxygen.

4. THE CONFINED SPACE SHOULD BE WELL LIT — In order for detection of ANY hazard or emergency, always increase visibility by lighting the pit.

If the pit tester needs more tools, always lower them in a bucket or sling to avoid physical injuries. NEVER toss tools into the pit.

5. TEST THE ENVIRONMENTAL CONDITIONS — Air becomes stagnant and oxygen becomes depleted in a confined space. The oxygen content of the atmosphere doesn't have to be that low for a person to pass out. Determine if there are any toxic gases, explosive conditions or a lack of oxygen. Detection devices, which CONTINUOUSLY monitor the atmosphere, are necessary. Oxygen or surface air should be pumped into the confined space. The atmosphere should be changed every two minutes.

6. ARTIFICIALLY VENTILATE THE CONFINED SPACE — Use portable ventilation fans to assure constant, good air circulation.

7. WEAR PROPER SAFETY APPAREL — The tester who enters the confined space MUST wear a hard hat and safety harness. There are many potentially dangerous situations for testers in a confined space besides depleted oxygen. If a water line breaks during testing, a properly fitted harness may be the only method of escape from water gushing into the pit. The harness allows the tester to be quickly pulled to safety. It's a good idea to have your clothes cleaned by a professional laundry service after testing in a pit. Inoculations for tetanus and other infectious diseases are also good precautions.

8. INSPECT SPACE FOR INSECTS, RODENTS AND REPTILES, AND DISPOSE OF THEM SAFELY — it's not unusual for black widow spiders, rats and rattlesnakes to be in a confined space. Make sure your method of destroying insects or rodents doesn't recontaminate the atmosphere in the confined space. NEVER use chemicals to exterminate the area while a technician is in the space.

What DO you do when you find a rattlesnake in the vault??

9. AT LEAST ONE TECHNICIAN SHOULD BE ABOVE THE CONFINED SPACE — Preferably, one technician should be above the pit during testing and one within calling distance for any emergencies. ALWAYS have a first aid kit handy and know what to expect and do if the tester requires more first aid than you have available.

10. IMMEDIATELY VACATE THE PIT AT THE ONSET OF NAUSEA OR DIZZINESS — The tester should IMMEDIATELY get into open air at the first sign of physical weakness. The pit should then be rechecked for toxic chemicals such as hydrogen sulfide; explosive chemicals such as methane; and depleted oxygen. It's said that there is no warning in an oxygen deficient atmosphere before a person passes out. If the pit is CONTINUOUSLY monitored, as suggested, these life-threatening conditions will be detected and corrected before a tester is exposed to them. The oxygen content in a confined space must register between 19.5 and 21 percent oxygen.

For more information on pits,²³ see *Backflow Prevention* issues May 1986, March 1986, and December 1984.

A Confined Space Means A Space That:

- T** Is large enough and so configured that an employee can bodily enter and perform assigned work; AND
- T** Has limited or restricted means for entry or exit (for example: tanks, vessels, silos, storage bins, hookers, vaults, and pits are spaces that may have limited means of entry); AND
- T** Is not designed for continuous employee occupancy

NOTE: Doorways and other portals through which a person can walk are not considered to be limited means of entry or exit.

Non-Permit Confined Space

- T** A confined space that does not contain or, with the respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

Permit-Required Confined Space

A confined space that has one or more of the following characteristics:

- T** Contains or has the potential to contain a hazardous atmosphere
- T** Contains a material that has the potential for engulfing an entrant
- T** Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls, or by a floor which slopes downward and tapers to a smaller cross-section
- T** Contains any other recognized serious safety or health hazard

The Effects of Oxygen Deficiency are Life Threatening.

POTENTIAL EFFECTS OF OXYGEN-DEFICIENT ATMOSPHERES

<u>Oxygen Content (% by Volume)</u>	<u>Effects and Symptoms (At Atmospheric Pressure)</u>
19.5%	Minimum permissible oxygen level.
15-19%	Decreased ability to work strenuously. May impair coordination and may induce early symptoms in persons with coronary, pulmonary, or circulatory problems.
12-14%	Respiration increases in exertion, pulse up, impaired coordination, perception, judgement.
10-12%	Respiration further increases in rate and depth, poor judgement, lips blue.
8-10%	Mental failure, fainting, unconsciousness, ashen face, blueness of lips, nausea, and vomiting.
6-8%	8 minutes, 100% fatal; 6 minutes, 50% fatal; 4-5 minutes, recovery with treatment.
4-6%	Coma in 40 seconds, convulsions, respiration ceases, death.

These values are approximate and vary as to the individual's state of health and his physical activities.

Exposure to atmospheres containing 12% or less oxygen can bring about unconsciousness without warning, and so quickly that the individual cannot help or protect himself.

SUNRIVER UTILITIES COMPANY

CONFINED SPACE ENTRY PERMIT

Job Description _____

Location _____ Date _____

Time Issued _____ **TIME EXPIRES** _____

Employees Assigned _____

Time of Entry _____

Time out of Space _____

Who Actually Entered? _____

HAVE THE FOLLOWING PRECAUTIONS BEEN TAKEN?

	<u>Yes</u>	<u>No</u>
Were hazard, testing and emergency procedures explained?	()	()
Were all procedures understood?	()	()
Was protective clothing worn?	()	()
Was someone standing by topside?	()	()
Was purging or ventilation required?	()	()
Were life lines and safety belts worn by those entering?	()	()
Was rescue equipment tested?	()	()

<u>Tests Conducted</u>	<u>Time</u>	<u>Results</u>	<u>By Whom</u>
O2 Deficiency	_____	_____	_____
Combustibility	_____	_____	_____
Toxicity	_____	_____	_____
Other _____	_____	_____	_____

Safety Equipment Used: _____

PERMIT ISSUED BY: _____

JOBSITE FOREMAN: _____

333-061-0070

Cross Connection Control Requirements

- (1) Water suppliers shall undertake cross connection control programs to protect the public water systems from pollution and contamination.
- (2) 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 point of delivery to the water user's premises.
- (3) Water suppliers shall develop and implement cross connection control programs that meet the minimum requirements set forth in these rules.
- (4) Water suppliers shall develop a procedure to coordinate cross connection control requirements with the appropriate local administrative authorities having jurisdiction.
- (5) 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:
 - (a) At the time of installation, any repair or relocation;
 - (b) At least annually;
 - (c) More frequently than annually for approved backflow prevention assemblies that repeatedly fail, or are protecting health hazard cross connections, as determined by the water supplier;
 - (d) After a backflow incident; or
 - (e) After an approved air gap is re-plumbed.
- (6) Approved air gaps, approved devices, or approved backflow prevention assemblies, found not to be functioning properly shall be repaired, replaced or re-plumbed 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.
- (7) 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.
- (8) Premises isolation requirements:
 - (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.

- (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) 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.
- (c) Where unique conditions exist, but not limited to, extreme terrain or pipe elevation changes, or structures greater than three stories in height, even with no actual or potential health hazard, an approved backflow prevention assembly may be installed at the point of delivery; and
- (d) Where the water supplier chooses to use premises isolation by the installation of an approved backflow prevention assembly on a one- or two-family dwelling under the jurisdiction of the Oregon Plumbing Specialty Code and there is no actual or potential cross connection, the water supplier shall:
 - (A) Install the approved backflow prevention assembly at the point of delivery;
 - (B) Notify the premises owner and water user in writing of thermal expansion concerns; and
 - (C) Take responsibility for testing, maintenance and repair of the installed approved backflow prevention assembly.
- (9) In community water systems, 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:

- (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.
- (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.
- (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.
- (10) 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. |

10,000 or more — \$350.

- (a) Billing invoices will be mailed to water systems in the first week of November each year and are due by January first of the following year;
 - (b) Fees are payable to Oregon Health Authority by check or money order;
 - (c) A late fee of 50 percent of the original amount will be added to the total amount due and will be assessed after January 31 of each year.
- (11) 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 (12) 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.
- (12) 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.
- (13) 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) 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.
- (15) 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

- (b) The test reports must be in a manner and form acceptable to the water supplier.
- (16) 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) 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.

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.

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,

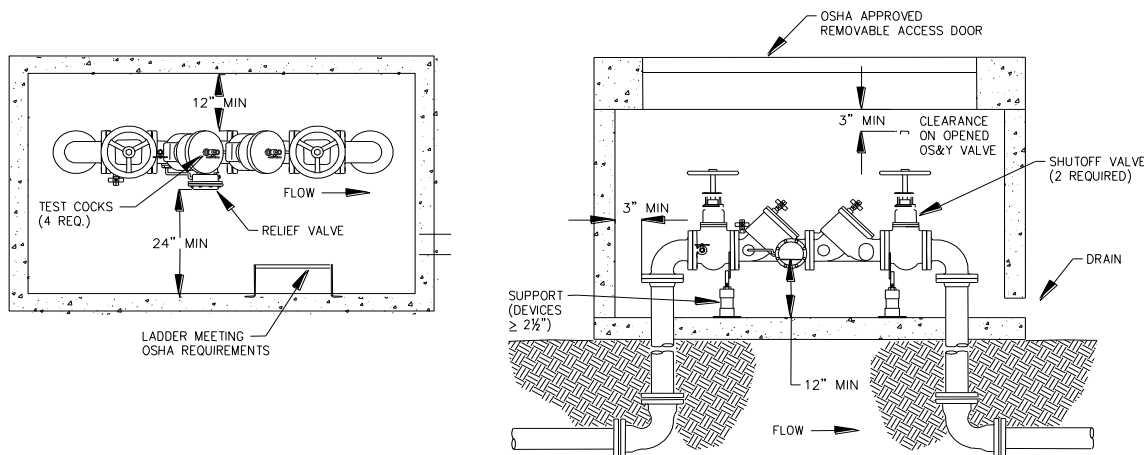
333-061-0071

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 Cross-Connection 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.
- (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

- (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.
- (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).
- (7) A Reduced Pressure Principle Backflow Prevention Assembly (RP) or Reduced Pressure Principle-Detector Backflow Prevention Assembly (RPDA):

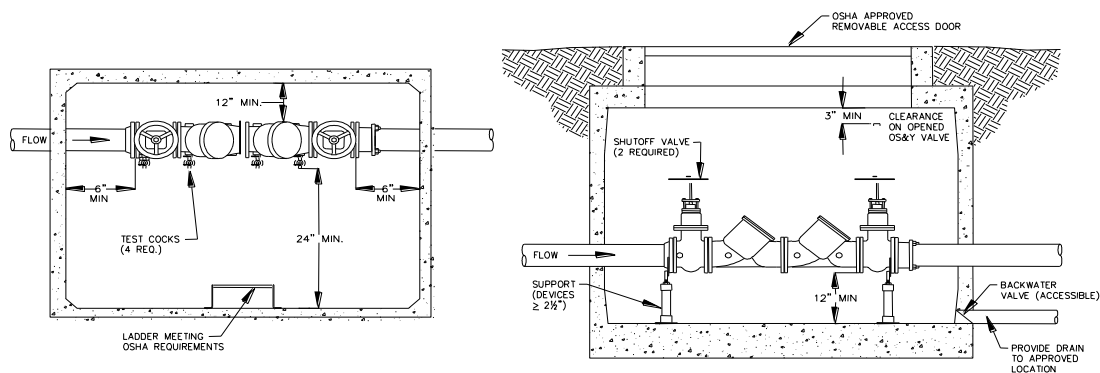
Figure 1



- (a) Shall conform to bottom and side clearances when the assembly is installed inside a building. Access doors may be provided on the top or sides of an above-ground vault;
- (b) Shall always be installed horizontally, never vertically, unless they are specifically approved for vertical installation;
- (c) Shall always be installed above the 100 year (1 percent) flood level unless approved by the appropriate local administrative authority having jurisdiction;

- (d) Shall never have extended or plugged relief valves;
 - (e) Shall be protected from freezing when necessary;
 - (f) Shall be provided with an approved air gap drain;
 - (g) Shall not be installed in an enclosed vault or box unless a bore-sighted drain to daylight is provided;
 - (h) May be installed with reduced clearances if the pipes are two inches in diameter or smaller, are accessible for testing and repairing, and approved by the appropriate local administrative authority having jurisdiction;
 - (i) Shall not be installed at a height greater than five feet unless there is a permanently installed platform meeting Oregon Occupational Safety and Health Administration (OR-OSHA) standards to facilitate servicing the assembly; and
 - (j) Be used to protect against a non-health hazard or health hazard for backsiphonage or backpressure conditions.
- (8) A Double Check Valve Backflow Prevention Assembly (DC) or Double Check Detector Backflow Prevention Assembly (DCDA):

Figure 2

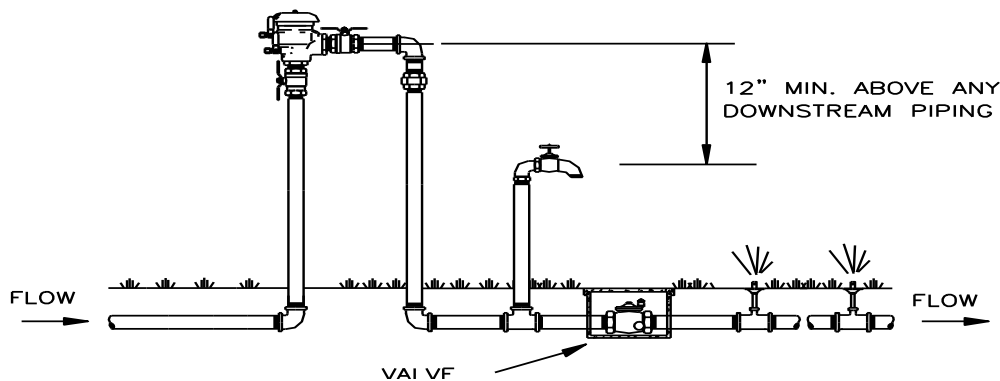


- (a) Shall conform to bottom and side clearances when the assembly is installed inside a building;
- (b) May be installed vertically as well as horizontally provided the assembly is specifically listed for that orientation in the Authority's Approved Backflow Prevention Assembly List.
- (c) May be installed below grade in a vault, provided that water-tight fitted plugs or caps are installed in the test cocks, and the assembly shall not be subject to continuous immersion;
- (d) Shall not be installed at a height greater than five feet unless there is a permanently installed platform meeting Oregon Occupational Safety and Health Administration (OR-OSHA) standards to facilitate servicing the assembly;
- (e) May be installed with reduced clearances if the pipes are two inches in diameter or smaller, provided that they are accessible for testing and

repairing, and approved by the appropriate local administrative authority having jurisdiction;

- (f) Shall have adequate drainage provided except that the drain shall not be directly connected to a sanitary or storm water drain. Installers shall check with the water supplier and appropriate local administrative authority having jurisdiction for additional requirements;
 - (g) Shall be protected from freezing when necessary; and
 - (h) Be used to protect against non-health hazards under backsiphonage and backpressure conditions.
- (9) A Pressure Vacuum Breaker Backsiphonage Prevention Assembly (PVB) or Spill-Resistant Pressure Vacuum Breaker Backsiphonage Prevention Assembly (SVB) shall:

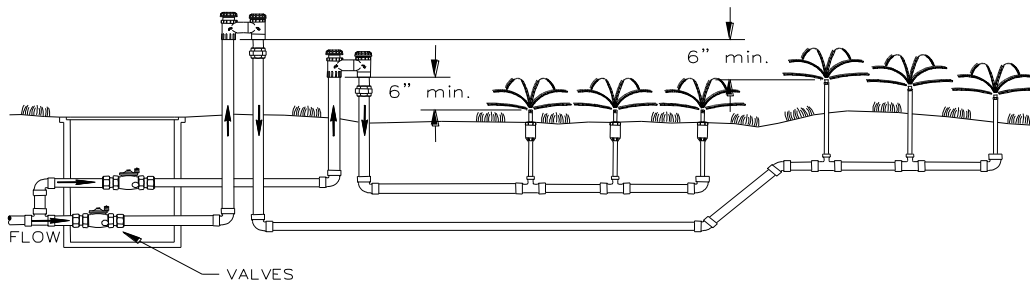
Figure 3



- (a) Be installed where occasional water discharge from the assembly caused by pressure fluctuations will not be objectionable;
- (b) Have adequate spacing available for maintenance and testing;
- (c) Not be subject to flooding;
- (d) Be installed a minimum of 12 inches above the highest downstream piping and outlets;
- (e) Have absolutely no means of imposing backpressure by a pump or other means. The downstream side of the pressure vacuum breaker backsiphonage prevention assembly or spill-resistant pressure vacuum breaker backsiphonage prevention assembly may be maintained under pressure by a valve; and
- (f) Be used to protect against backsiphonage only, not backpressure.

(10) An Atmospheric Vacuum Breaker (AVB) shall:

Figure 4



- (a) Have absolutely no means of shut-off on the downstream or discharge side of the atmospheric vacuum breaker;
- (b) Not be installed in dusty or corrosive atmospheres;
- (c) Not be installed where subject to flooding;
- (d) Be installed a minimum of six inches above the highest downstream piping and outlets;
- (e) Be used intermittently;
- (f) Have product and material approval under the Oregon Plumbing Specialty Code for non-testable devices.
- (g) Not be pressurized for more than 12 hours in any 24-hour period; and
- (h) Be used to protect against backsiphonage only, not backpressure.

Stat. Auth.: ORS 448.131

Stats. Implemented: ORS 448.131, 448.278

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EDUCATION

Post Doctoral Fellow *Stanford University* Jan. 2000 – Sept 2000
Research Topic: Temporal Bioaccessibility of Arsenic, Chromium, and Lead.
Mentor: Scott Fendorf

Ph.D. Soil Science/Soil Chemistry *University of Idaho* Jan. 2000
Dissertation Title: Seasonal Cycling of Redox-Active Metal(loid)s within Mining-
Impacted Wetlands.
Major Professor: Scott Fendorf

M.S. Geology *University of Idaho* Dec. 1996
Thesis Title: The Effects of Simulated Dredging and Flooding on Trace-Element Rich
Sediments in Lake Coeur D'Alene and the Coeur D'Alene River, Idaho.
Major Professor: Kenneth Sprenke

B.S. Geology/Environmental Sciences *Cortland College* Aug. 1994
Minor in Biological Sciences
Senior Thesis Title: A Geophysical Investigation of the Port Leyden Nelsonite.
Major Professor: Robert Darling

PROFESSIONAL EXPERIENCE

Department Chair Engineering *Clackamas Community College* 2008, 2011-Present
Director Oregon Backflow Training *Clackamas Community College* 2008-Present
Professor *Clackamas Community College* Sep. 2006-Present
Assistant Professor *San Francisco State (SFSU)* Aug. 2001 - 2006
Post Doctoral Scientist/Instructor *Stanford University* Jan. 2000 - Sept. 2000
Visiting Researcher *Stanford University* Mar. 1999 -Dec. 2000
Teaching and Research Assistant *University of Idaho* Aug. 1995 - Jan. 1999

COURSES INSTRUCTED

Fifty courses instructed over 25 years at University of Idaho, Stanford, San Francisco State University and Clackamas Community College.

-All teaching evaluations have been excellent and are available upon request.

Water Distribution I, Water Treatment I-II, Mathematics For Water and Wastewater Operation, Water and Wastewater Operations I-III, Environmental Chemistry I and II, Elementary and Aquatic Microbiology, Wastewater Collections, Hydraulics, Geostatistics, Contaminant Hydrogeology, Hydrogeology, Environmental Geology, Planetary Climate Change, Introductory Geology, Soil Science

Matthew La Force's Curriculum Vitae

HONORS AND AWARDS

Western Soil Science Society of America	
1 st place oral presentation	June 2000
Pacific Division of AAAS	
1 st place oral presentation	June 2000
American Association for Advancement of Science (AAAS)	
1 st place oral presentation	June 1996
Pacific Division of AAAS	
Sunshine Mining Award for Excellence in Geosciences	June 1996
Pacific Division of AAAS	
Robert I. Larus Travel Award	June 1996
<i>Sigma Xi</i> Excellence in Research and Writing, SUNY Cortland	May 1994

PROFESSIONAL ORGANIZATIONS AND EDITORIAL AFFILIATIONS

Board of Directors/Educational Representative
 Oregon Environmental Services Advisory Council
Member of Oregon DEQ Operator Certification Program Advisory Committee
Member of Oregon Water and Education Foundation
Member of Waterworks Short School Clackamas Community College
Member of the Oregon Cross Connection Specialist Regional Subcommittee
Member of USC Foundation For Cross Connection Control
Director Oregon Backflow Training Program
President West Linn Youth Lacrosse
Vice President West Linn Youth Lacrosse
Past President of Western Soil Science Society of America
Past Secretary/Treasurer of Western Soil Science Society of America
Past Executive Committee Member - American Association of Advancement of Sciences
 -Pacific Division
Ad hoc reviewer for *Applied Geochemistry*, *Environmental Science and Technology*,
Journal of Environmental Quality, and *Soil Science Society of America Journal*.

PUBLICATIONS

Book Chapters

Hansel, C.M., M.J. LaForce, S.E. Sutton, and S. Fendorf. 2002. Ecosystem Dynamics of Zinc and Manganese within a Mine-Waste Impacted Wetland. In S. Wood and R. Hellmann (Eds.) "Water-Rock Interactions, Ore Deposits, and Environmental Geochemistry, A Tribute to David A Crerar", Geochemical Society Special Publication, Geochemical Society of America. 411-454.

Matthew La Force's Curriculum Vitae

Research Articles

- Fendorf, S.E., M. La Force, and G.C. Li. 2004. Temporal Changes in Soil Partitioning and Bioaccessibility of Arsenic, Chromium, and Lead. *J Environ Qual* 33: 2049-2055.
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Matthew La Force's Curriculum Vitae

Professional Papers

- C. Oze, M.J. La Force, C. Wentworth, D.K. Bird and R. Coleman. 2002. Assessing mineral weathering and chromium geochemistry in the Willow Core, Santa Clara County, Ca. United States Geologic Survey Open File Report 2002
- M.J. La Force, J. Neiss. 2002. Assessing serpentine soil geochemistry and distribution. Inspiration Point, Presidio, San Francisco, Ca. Open File Report 2002

INVITED PRESENTIONS AND LECTURES

- La Force, M.J., and S.E. Fendorf. 1996. Trace element mobility in the Coeur d'Alene Basin. Northwest Science Association. Spokane, WA.
- Fendorf, S.E., M.J. La Force, and C.M. Hansel. 2000. Trace element cycling within wetland ecosystems. Peninsula Geologic Society Meeting, Stanford, CA.
- La Force, M.J., and S.E. Fendorf. 2000. Arsenic speciation and co-distribution with Fe in a palustrine emergent wetland. Western Soil Science Society of America, Ashland Or.
- La Force, M.J. 2002. 4th Biennial San Francisco Ecological Restoration Conference. San Francisco Recreation and Parks Department. Hosted workshop on native soils and bioremediation. Randall Museum.
- La Force, M.J. 2002. Sustainable Park Workshop Series. San Francisco Recreation and Parks Department. Hosted workshop on diagnostic soil properties and the 12 soil orders. Randall Museum.
- La Force, M.J. 2003. The geochemistry of serpentine soils at inspiration point. San Jose State Geology Department.
- Invited Guest Lecture, Stanford University. 2001. Science of Soils. Created and implemented pedology and Keys to Soil Taxonomy lectures.
- Invited Guest Lecture, Stanford University. 2001. Science of Soils. Created and implemented pedology and Keys to Soil Taxonomy lectures.
- Invited Guest Lecture, Taylor Middle School. Implemented a guest lecture on rock and mineral identification. I encouraged students to appreciate the importance of the geosciences.
- Invited Guest Lecture, Sequoia High School. I implemented a guest lecture on soil formation and agriculture.

Matthew La Force's Curriculum Vitae

Papers presented at professional meetings

- La Force, M.J., R. Hay, and B. Darling. 1994. A geophysical investigation of the Port Lyeden Nelsonite. Geological Society of America, Binghamton, NY.
- La Force, M.J and S.E. Fendorf. 1996. Trace element dynamics in the Coeur d'Alene Basin. Northwest Science Association. Spokane, WA.
- La Force, M.J, G.C. Li, and S.E. Fendorf. 1996. Trace element cycling from dredging of Lake Coeur d'Alene, Idaho. Pacific Division American Association for Advancement of Science. San Jose, CA.
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- Bostick, B.C., La Force, M.J, C. M. Hansel, and S.E. Fendorf. 1998. Localized structure of Zn in reducing environments. Soil Science Society of America. Baltimore, MD.
- La Force, M.J, C. M. Hansel, and S.E. Fendorf. 1999. Iron and As mobility in a contaminated wetland. Stanford Synchrotron Radiation Laboratory Users Conference. Stanford, CA
- La Force, M.J, B. Wielinga, G.C. Li, and S.E. Fendorf. 1999. Redox dynamics of trace elements in wetland soils. Soil Science Society of America. Salt Lake City, UT.
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Jim Neiss, M.J. LaForce. 2002. Influences of non native plants on the geochemical influences of a serpentinite soil. Presidio, San Francisco, Ca. Geological Society of America. Corvallis, OR

Erdmann Rogge and Matthew J. La Force. 2002. Hydrostratigraphy of the Westside Groundwater Basin, San Francisco and San Mateo Counties, California American Geophysical Union. San Francisco California.

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Charlotte Hedlund and Matthew J. La Force. 2003. Hydrogeology and Geochemistry of the Montara Moss Beach Aquifer System Geological Society of America. Geologic Society of America Abstract and Programs. Puerto Vallarta, Mx. A-25.

Matthew J. La Force and Megan Simpson. 2004. Background Trace Element Concentrations in the Franciscan Complex. WSSA/PDAAAS, Logan Utah.

GRANTS

M. La Force. 2011. \$28,000. Future Connects. City of Portland. Funded

Nurmi, J.T and La Force, M.J. 2012. \$129,481. EPA Small Water System Grant. CCC WET Online Course for Small water systems. Submitted.

M. LaForce and J. Lewis. 2008. \$~2,500. CCC Foundation Mini-grant for multiprobe use at ELC. Funded and then funding rescinded by CCC.

M. La Force and K. Grove. 2006. \$24,948. Hydrostratigraphic investigation of the North Westside Basin of San Francisco and northern San Mateo Counties. San Francisco Public Utilities Commission.

L. White, K. Grove, M. La Force, R. Pestrone, D. Dempsey, O. Garcia, and T. Garfield, 2005. \$205,218. Opportunities to Enhance Diversity in the Geosciences program, "Reaching Out to Communities and Kids with Science in San Francisco-SF-ROCKS". National Science Foundation. Funded

Matthew La Force's Curriculum Vitae

- M.J. LaForce, B.Manning, A. Ichimura, and S. Bollens. 2005. \$192,100. Acquisition of a powder X-ray diffraction instrument for environmental analysis and educational outreach. National Science Foundation: Major Research Instrumentation program. Funded.
- L. White, K. Grove, M. La Force, R. Pestrone, D. Dempsey, O. Garcia, and T. Garfield, 2004. \$279,118. Opportunities to Enhance Diversity in the Geosciences program, "Reaching Out to Communities and Kids with Science in San Francisco-SF-ROCKS". National Science Foundation. Funded
- M.J. LaForce. 2004. \$5,000. Determination of the pre-1890 paleolake bottom of the eastern arm of Mountain Lake, Presidio, California. Presidio Trust. Funded.
- L. White, K. Grove, M. La Force, R. Pestrone, D. Dempsey, O. Garcia, and T. Garfield, 2003. \$263,863. Opportunities to Enhance Diversity in the Geosciences program, "Reaching Out to Communities and Kids with Science in San Francisco-SF-ROCKS". National Science Foundation. Funded
- M.J. LaForce and J. Caskey. 2002. \$20,600. Geochemical and Surficial soils/geologic boundary mapping at the Presidio. Presidio Trust. Funded.
- M.J. LaForce. 2001. 5,000\$. Evaluation of nutrient levels in Elkhorn Slough. SFSU mini grant. Funded.
- M.J. LaForce and K. Strathmann. 2001. 10,465\$. Study of soils and geologic boundaries at Inspiration Point, Presidio Ca. Presidio Trust. Funded.
- C. Oze, M.J. LaForce, R. Coleman, and D.K. Bird. 2001. 6,740\$. Assessing mineral weathering and chromium geochemistry in the Willow Core, Santa Clara County, CA. United States Geologic Survey. Funded.
- M.J. LaForce. 2001. 306,022\$. Assessing benthic and planktonic habitats via microbial enumerations coupled with sediment and porewater geochemical analysis of Elkhorn Slough. Monterey Bay National Marine Sanctuary. Not Funded.
- M.J. LaForce and B. Manning. 2001. 279,032\$. Field and laboratory investigation of selenium cycling and speciation in the San Joaquin River. United States Department of Agriculture-National Research Initiative. Not Funded.
- M.J. LaForce and B. Manning. 2001. 1,042,984\$. Field and laboratory investigation of selenium cycling and speciation in San Francisco Bay and the San Joaquin River. CALFED. Not Funded.

Matthew La Force's Curriculum Vitae

M.J. LaForce, B.Manning, A. Ichimura, and S. Bollens. 2004. \$192,100. Acquisition of a Powder X-ray Diffraction Instrument for Environmental Analysis and Educational Outreach. NSF:MRI program. Funded.

L. White, K. Grove, R. Pestrong, N. Garfield, D. Dempsey, and M.J. LaForce. 2003. 1,200,000\$. Reaching Out to Communities and Kids with Science in San Francisco: SF ROCKS. NSF. Funded.

M.J. LaForce. 2001. 306,022\$. Assessing benthic and planktonic habitats via microbial enumerations coupled with sediment and porewater geochemical analysis of Elkhorn Slough. Monterey Bay National Marine Sanctuary. Not Funded.

M.J. LaForce and L. White. 2001. 208,901\$. Hydrologic Investigation of the Islais Creek Watershed. Prop 13 CALFED Drinking Water Program. Not Funded.

M.J. LaForce and B. Manning. 2001. 279,032\$. Field and laboratory investigation of selenium cycling and speciation in the San Joaquin River. United States Department of Agriculture-National Research Initiative. Not Funded.

STUDENT ADVISING-* committee member

Erdmann Rogge. 2003. MS thesis: Hydrostratigraphy of the Westside Groundwater Basin, San Francisco and San Mateo Counties, California

Charlotte Hedlund. 2003. MS thesis: Hydrogeology and Geochemistry of the Northern Groundwater Basin, San Mateo County, California

Megan Simpson. 2004. MS thesis: Investigating Background Trace Element Concentrations in the Franciscan Complex San Francisco, California

Peter Gorman. 2004. MS thesis: Temporal and Spatial Variability of Hydraulic Conductivity in the Russian River Streambed, Sonoma County, California.

Andrew Matthew. Expected 2005. MS thesis: A Geochemical and Geophysical Investigation of the Serpentine Soils at the Presidio, San Francisco, Ca.

*Kasha Parker. Fall 2004. MS thesis: Surficial Sediment Distribution and Changes in the Central San Francisco Bay Along the Southeastern Tiburon Peninsula.

*Chimi Yi. Expected Fall 2004. Depositional and Deformational History of the Colma and uppermost Merced Formations along the coast of San Francisco
Doug Wood. Senior Thesis 2001. Determination of the bioavailability to humans of the metals As, Cr, and Pb with respect to soil ingestion.

Jim Neiss. Senior Thesis 2002. The geochemistry of serpentine soils at Inspiration Point Presidio, San Francisco, Ca. Fall 2002.

*Joe Petsche. Senior Thesis 2003. Delineation of Sub-surface Serpentinite Boundaries with the San Francisco Presidio.

*Mahasringha M. Monroe. Senior Thesis 2003. Late Pleistocene Uplift Along the Seal Cove Fault Using Emergent Marine Terraces, Moss Beach, California.

Jane Duxbury. Senior Thesis 2004. Determination of the Pre-1890 Paleolake Bottom of the Eastern Arm of Mountain Lake, Presidio, California.

REFERENCES

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