WORKSHOP OUTLINE

NAME OF WORKSHOP

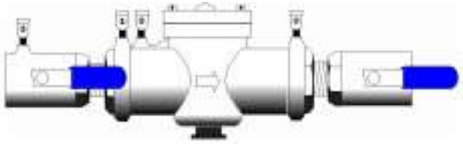
Backflow Device Tester Certification Course Hours: 4.0 CEU

Institution: Clackamas Community College

Objectives: Primary emphasis of this five day course will be the understanding of backflow prevention devices used for water system cross connection control. Subjects covered will include proper installation procedures and approved testing procedures.

Learning Outcome: Students will learn to identify common, actual, and potential cross connection hazards; students will be introduced to the basic requirements for carrying out a cross connection program.

The CEUs earned apply towards the backflow tester certification through the State of Oregon Health Authority.



Oregon Backflow Training

5-Day Backflow Tester Certification
Schedule

Monday

8:00-10:00	Lecture
10:00-10:15	*Break*
10:15-12:00	Lecture
12:00-1:00	*Lunch on your own*
1:00-2:45	Hands on training
2:45-3:00	*Break*
3:00-5:00	Hands on training

Tuesday

8:00-10:00	Lecture
10:00-10:15	*Break*
10:15-12:00	Lecture
12:00-1:00	*Lunch on your own*
1:00-2:45	Hands on training
2:45-3:00	*Break*
3:00-5:00	Hands on training

Wednesday

8:00-10:00	Lecture
10:00-10:15	*Break*
10:15-12:00	Lecture
12:00-1:00	*Lunch on your own*
1:00-2:45	Hands on training
2:45-3:00	*Break*
3:00-5:00	Hands on training

Thursday

8:00-10:00	Lecture
10:00-10:15	*Break*
10:15-12:00	Lecture
12:00-1:00	*Lunch on your own*
1:00-2:45	Hands on training
2:45-3:00	*Break*
3:00-5:00	Hands on training

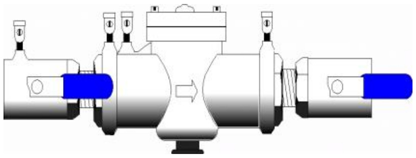
Friday

8:00-10:00	Written Exam
10:00-10:15	*Break*
10:15-12:00	Hands on Exam
12:00-1:00	*Lunch on your own*
1:00-2:45	Hands on Exam
2:45-3:00	*Break*
3:00-5:00	Hands on Exam

Water & Environmental Technology
CLACKAMAS COMMUNITY COLLEGE

CLACKAMAS COMMUNITY COLLEGE
Smart.

19600 Molalla Avenue
Oregon City, OR 97045
503-594-3345



Oregon Backflow Training

CROSS CONNECTION CONTROL TESTER COURSE

Oregon Health Authority Approved

This is a five-day course designed to provide specialized information to individuals involved in the installation and testing of backflow devices.

<u>Course Content</u>

<u>Monday</u>:

Types of cross connections; historic cases; health hazards associated with cross connections; terms and definitions; the reduced pressure principle backflow prevention assembly (RPBA); troubleshooting techniques for the RPBA device; hands-on experience on the RPBA device.

<u>Tuesday</u>:

Types of approved devices; containment of cross connection hazards; device installation; the double check valve assembly backflow prevention device (DCVA); troubleshooting techniques for the DCVA; hands-on experience on DCVA.

<u>Wednesday</u>:

State of Oregon administrative rules on cross connection control; legal aspects of cross connection control; plumbing code requirements; air gap piping arrangements; atmospheric vacuum breakers; pressure vacuum breakers; spill resistant vacuum breakers; more hands-on practice on RPBA and DCVA devices.

<u>Thursday</u>:

How to establish a cross connection program; program implementation; municipal responsibilities of the cross connection program with the State of Oregon; where to go for help; tester safety, repair fundamentals. Hands-on practice with vacuum breakers.

<u>Friday</u>:

Review for exam; course exam; final check-out on devices; review of exam.

<u>Course Completion</u>

Those who pass the written examination and hands-on performance tests may apply to the Oregon Health Authority for certification as a Backflow Device Tester. The Oregon Health Authority requires proof of high school diploma or GED certificate in order to complete the certification process.

Clackamas Community College

(503) 594-3345
19600 Molalla Avenue
Oregon City, OR 97045

The class will be taught by Matthew J. LaForce, Ph.D.

Dr. LaForce received his Masters of Science degree in geology and his doctoral degree in soil science working in inorganic environmental chemistry from the University of Idaho.

After completing his Ph.D., Doctor LaForce was a research associate at Sanford University in environmental chemistry and an assistant professor of hydrogeology at San Francisco State University.

Dr. LaForce is currently the departmental head of Engineering Sciences at Clackamas Community College. He has been instructing water and wastewater courses for over 20 years.

Dr. MATTHEW J. LA FORCE
Department Chair Engineering Sciences
Clackamas Community College
Email: laforce@clackamas.edu
Phone: 503-594-3148

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

HONORS AND AWARDS

Western Soil Science Society of America
1st place oral presentation June 2000
Pacific Division of AAAS
1st place oral presentation June 2000
American Association for Advancement of Science (AAAS)
1st 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
Sigma Xi 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.

Research Articles

Fendorf, SE, 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.

C.M. Hansel, M.J., La Force, S.E. Fendorf and S. Sutton. 2002. Spatial and temporal association of As and Fe species on aquatic plant roots. *Environ. Sci Technol.* 36:1988-1994.

La Force, M.J., C.M. Hansel, and S.E. Fendorf. 2002. Seasonal transformation of manganese in a Palustrine Emergent Wetland. *Soil Sci. Soc. Am. J.* 66:1377-1389.

Bostick, B.C., C.M. Hansel, La Force, M.J., and S.E. Fendorf. 2001. Seasonal fluctuations in Zn speciation within a contaminated wetland. *Environ. Sci. Technol.* 35:3823-3829.

La Force, M.J., G.C. Li, and S.E. Fendorf. 2000. Arsenic speciation, seasonal transformations, and co-distribution with iron in a mine waste palustrine emergent wetland. *Environ. Sci. Technol.* 34:3937-3943.

La Force, M.J. and S.E. Fendorf. 2000. Solid phase iron characterizations during common selective sequential extractions. *Soil Sci. Soc. Am. J.* 64:1608-1614.

La Force, M.J., C.M. Hansel, and S.E. Fendorf. 2000. Constructing simple wetland sampling devices. *Soil Sci. Soc. Am. J.* 64:809-811.

La Force, M.J, S.E. Fendorf, G.C., Li, and R.F. Rosenzweig. 1999. Redistribution of trace elements from contaminated sediments of Lake Coeur d'Alene during oxygenation. *J. Environ. Qual.* 28:1195-1201.

Harrington, J.M., M.J. La Force, W.C. Rember, S.E. Fendorf, and R.F. Rosenzweig. 1998. Phase associations and mobilization of iron and trace elements in Coeur d'Alene Lake, Idaho. *Environ. Sci. Technol.* 32:650-656.

La Force, M.J., S. Fendorf, G.C. Li, G.M. Schneider, and R.F. Rosenzweig. 1998. A laboratory evaluation of trace element mobility from flooding and nutrient loading of Coeur d'Alene river sediments. *J. Environ. Qual*. 27:318-328.

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.

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.

La Force, M.J, G.C. Li, and S.E. Fendorf. 1996. Trace element mobility as a consequence of dredging Lake Coeur d'Alene, Idaho. American Association for Advancement of Science. Seattle, WA.

La Force, M.J, G.C. Li, and S.E. Fendorf. 1997. Trace element mobility from flooding and nutrient loading of Coeur d'Alene River sediments. Soil Science Society of America. Anaheim, CA.

La Force, M.J, G.C. Li, E.A. Rochette, and S.E. Fendorf. 1998. Trace element attenuation within a mine waste contaminated wetland. Soil Science Society of America. Baltimore, MD.

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.

La Force, M.J., and S.E. Fendorf. 2000. Arsenic speciation, seasonal transformations, and co-distribution with iron in a mine waste palustrine emergent wetland. Western Soil Science Society of America. Ashland, OR.

La Force, M.J. M. Barnett, P.J. Jardine, and S.E. Fendorf. 2000. The effects of residence time on contaminant bioavailability. Soil Science Society of America. Minneapolis, MN.

La Force, M.J. M. Barnett, P.J. Jardine, and S.E. Fendorf. 2001. The effects of residence time on contaminant bioavailability. Western Soil Science Society of America. Moscow, Id.

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.

Erdmann Rogge and Matthew J. La Force. 2003. Hydrostratigraphic Units of the Westside Groundwater Basin, San Francisco and San Mateo Counties, California. American Association for Advancement of Science Pacific Division and Western Soil Science Society of America Abstract and Programs. San Francisco State University, Ca 19.

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. Pestrong, 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

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. Pestrong, 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. Pestrong, 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.

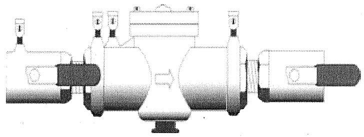
*Mahasringha M. Monroe. Senior Thesis 2003. Late Pleistocene Uplift Along the Seal Cove Fault Using Emergent Marine Terraces, Moss Beach, California.

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

REFERENCES

John Lewis
Emeritus Engineering Science Department Chair
Clackamas Community College
19600 South Molalla Dr
Oregon City OR 97045

Dr. James Nurmi
Water Quality Instructor
Engineering Science Department Chair
Clackamas Community College
19600 South Molalla Dr
Oregon City OR 97045



Oregon Backflow Training

Oregon Department of Human Services – Health Services
Approved Training Course in Cross Connection Control

DAY 1

Registration and Distribution of Materials

WELCOME !

- ❑ Introduction of Instructors and Participants
- ❑ Review of Program and Course Objectives
- ❑ Basic Cross Connection Definitions
- ❑ Oregon Cross Connection Program – Oregon Administrative Rules

Film - "Working Together for Safe Water"

Five Types of Cross Connections

Health Hazards Associated with Cross Connections

Review of actual backflow incidents and introduction to incident summary resources

- ❑ Sources of backflow incidents

BREAK

The "Autumn Lane" Backflow Incident

- ❑ Cross connection hazards associated with residential water use
- ❑ Residential cross connection control

Basic Hydraulic Concepts: Understanding Backpressure and Backsiphonage

Introduction to the Reduced Pressure Backflow Assembly

- ❑ Specifications of RP Assemblies
- ❑ Principles of the Operation of the RP Assembly
- ❑ Testing Procedures for the RP Assembly Using a Differential Pressure Gauge

LUNCH

RP Assembly Test Procedure Demonstration

- ❑ Proper Use of the Test Report Form

Individual Testing of RP Assemblies

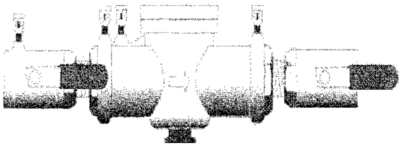
BREAK

Troubleshooting Techniques for RP Assemblies

Review and Assignment of Homework

Day 2

Oregon Backflow Training



Oregon Heath Authority Approved Training Course in Cross Connection Control

DAY2

AM

- Review of Quizzes from Monday's Homework
- Film - "AWWA Cross Connection Control Program and Backflow Assemblies"
- Summary of Approved Cross Connection Control Methods Requirements for Backflow Assemblies in the State of Oregon
- Device vs. Assemblies Definitions
- Requirements of the Foundation for Cross Connection Control and Hydraulic Research at USC List of Approved Devices for Oregon (Lab and Field Evaluations

BREAK

Protection of Public Water Systems from Cross Connection

Hazards:

- Requirements for Community and Non-Community Water Systems

☐ **Property Line** Protection, **Point of Use** Protection

☐ Discussion of Special Application Devices (Plumbing Code)

Installation Requirements for Reduced Pressure Assemblies Minimum

Requirements of the Health Authority

☐ Lecture Demonstration and Hands on Testing of RP Assemblies (Relief valve problems)

☐ Lecture Demonstration and Hands on Testing of RP Assemblies (Check #2 Tight, Disc Compression, or Leaks)

LUNCH

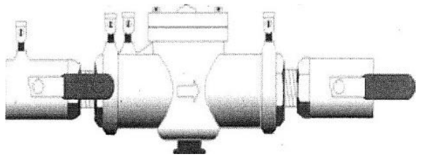
☐ Lecture Demonstration and Hands on Testing of RP Assemblies (Check #1 Problems)

☐ Lecture Demonstration and Hands on Testing of RP Assemblies (Continuous Discharge)

☐ Lecture Demonstration and Hands on Testing of RP Assemblies (Leaky Shutoff Valve #2 problems)

☐ Film, RP Assemblies problems and 10th edition test procedures

Oregon Backflow Training



DAY3

Oregon Department of Human Services - Health Services Approved Training Course in Cross Connection Control

MORNING

Review of Quizzes from Tuesday's Nights Homework (Quiz 4-6)

Protection of Public Water Systems from Cross Connection Hazards:

Definitions and Requirements for Community and Non-Community

Water Systems

- **Property Line** Protection
- **Point of Use** Protection

Lecture on Installation Troubleshooting Requirements for Reduced

Pressure Backflow Assemblies

Lecture Introduction of the <u>Double Check Backflow Assembly</u>

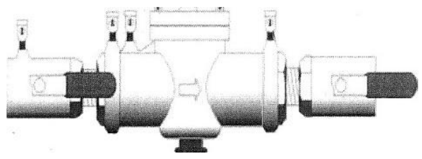
- Specifications of DCV Assemblies
- Principles of the Operation of the DCV Assembly
- Testing Procedures for the DCV Assembly Using the Differential Pressure gauge
- OBT "Three Rules" of Proper Testing of Double Check Valve Assemblies
- Lecture Demonstration and Hands on Testing of DC Assemblies (USC Foundation Video and Test Procedures)

BREAK

- OBT "Three Rules" of Proper Testing of Double Check Valve Assemblies
- Lecture Demonstration and Hands on Testing/Troubleshooting of DC Assemblies (Leaking 0 psid and tight check valves less than 1 psid)
- Lecture Demonstration and Hands on Testing/Troubleshooting of DC Assemblies (leaky shut off valve #1 with all checks passing)
- Lecture Demonstration and Hands on Testing/Troubleshooting of DC Assemblies (shut off SO valve #2 with both checks working and then Check #2 leaks in addition to SO#2)
- Lecture Demonstration and Hands on Testing/Troubleshooting of DC Assemblies (shut off valve #2, bad #2 check, and backpressure)

- **LUNCH**
- Lecture Demonstration and Hands on Testing with a Procter of an RP assembly!

Oregon Backflow Training



DAY4

Oregon Health Authority Approved Training Course in Cross Connection Control

Review of quizzes from day 3 activities

Cross connection control

- □ Review of approved cross connection methods
- □ Lecture on AVB device and PVB and SVB Installation Requirements
- □ Lecture on PVB and SVB Assemblies 10 Edition test procedures

BREAK

- □ Lecture Demonstration and Hands on Testing/Troubleshooting of PVB and SVB Assemblies (Leaking 0 psid and tight check valve less than 1 psid)
- □ Lecture Demonstration and Hands on Testing/Troubleshooting of PVB and SVB Assemblies (air inlets does not hold)
- □ Lecture Demonstration and Hands on Testing/Troubleshooting of PVB and SVB Assemblies (Leaking Shut Off valves)

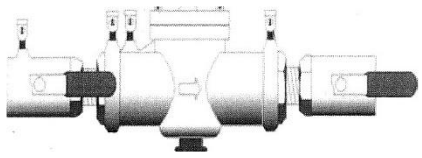
LUNCH

- □ Installation requirements for all backflow assemblies (Degree of hazard, hydraulic conditions, continuous pressure?)
- □ Backflow assembly identification
- □ Improper Installation of assemblies (real world field observations)

Break

- □ Safety considerations for backflow assembly testers Confined space, Lock out Tag Out, First Aid
- □ Review 2 Dead and 5 Injured in Oregon Confined Space Entry
- □ Film Backflow problems in Hospitals and Backflow Incidents in Cross Connection
- □ Final Exam Review

Oregon Backflow Training



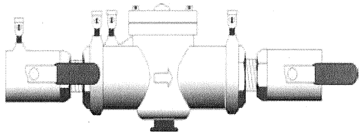
DAY5

Oregon Health Authority Approved Training Course in Cross Connection Control

- ◻ OHA Scan Tron Final Exam (100 questions, 36 True False, Matching (Definitions), 64 Multiple choice with last ~15 questions Internal part Identification
- ◻ Lecture and Hands testing and troubleshooting of Double Check Valve, Pressure and Spill Resistant Vacuum Breaker Assemblies

LUNCH

- ◻ Hands On lecture and proctoring of Double Check Valve, Pressure and Spill Resistant Vacuum Breaker Assemblies.
- ◻ Backflow Certification Awarding and OHA State Certification Application discussion.
- ◻ Options for retakes of the 5 day tester class.



Oregon Backflow Training

Oregon Department of Human Services – Health Services
Approved Training Course in Cross Connection Control

COURSE OBJECTIVES

Backflow Prevention Devices

The primary emphasis of this 4-day course will be the understanding of backflow prevention devices used for water system cross connection control. Subjects covered will include **proper installation procedures, approved testing procedures,** and an introduction to **backflow device repair techniques.**

Cross Connection Hazards

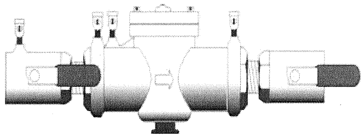
We will learn to identify common actual and potential cross connection hazards that exist in a variety of facilities. Approved methods of cross connection control will be provided for common identified hazards. (The Cross Connection Inspector Course provides extensive information on inspection methods for cross connection hazards.)

Cross Connection Programs

Oregon regulations require that public water systems have an on-going cross connection control program. This course will introduce attendees to the basic requirements for carrying out a cross connection program. (The Cross Connection Control Inspector Course provides extensive training on ways to develop and implement a good program for cross connection control.)

COURSE REQUIREMENTS

Exam:	100 questions of the following type: true-false, matching, and multiple choice. To pass the exam, a score of **75%** is required.
Hands-on Testing:	Attendees will be asked to demonstrate the proper test procedure for each of the backflow prevention devices.



Oregon Backflow Training

DEFINITIONS

Cross Connection: Any actual or potential physical connection between a potable water line and any pipe, vessel or equipment containing a non-potable fluid so that it is possible to introduce the non-potable fluid into the potable fluid by backflow.

Backflow: The reverse of flow from its normal or intended direction of flow. Backflow can be caused by backpressure or backsiphonage.

Backpressure: Backflow that results from pressure in the downstream piping that is higher than the supply pressure. In a backpressure condition, all pressures are above atmospheric pressure.

Backsiphonage: Backflow that results from negative pressure (partial vacuum) in the supply piping system.

Pressure: Force per unit area. Example: lb./square inch

Atmospheric Pressure: The pressure exerted by the 7½ mile high layer of air resting on the surface of the earth. At sea level, the atmosphere exerts an absolute pressure of 14.7 psi.

Gauge Pressure: Pressure values relative to the earth's atmospheric pressure, when the atmospheric pressure is given a value of zero.

Examples
0 psig = atmospheric pressure
10 psig = 10 psi above atmospheric pressure
-10 psig = 10 psi below atmospheric pressure

Absolute Pressure: Pressure values relative to absolute zero pressure. Absolute pressure = gauge pressure + atmospheric pressure.

Examples
14.7 = atmospheric pressure at sea level
0 = perfect vacuum

Vacuum: Pressure below atmospheric pressure. The term vacuum includes all degrees of partial vacuums.

Pollution: Introduction of materials into water that renders the water unfit for its intended uses.

Contamination: Introduction of materials into water that renders the water unsafe for human or animal consumption.

ENGINEERING SCIENCES DEPARTMENT
WATER & ENVIRONMENTAL TECHNOLOGY
WET-109
Backflow Assembly Operations and Testing
Lecture/Lab

Water & Environmental Technology CLACKAMAS COMMUNITY COLLEGE

M, T, W, Th, Fri:
Lecture/Lab, T150
8-4:50 pm

WET 109- Backflow Assembly Operations and Testing
COURSE SYLLABUS

Course Title: Backflow Assembly Operations and Testing
Instructors: Matthew LaForce, Office in Dejardin-DJ210 or Training CenterB T150, **laforce@clackamas.edu**, 503-594-3148,
Office Hours: Tues 12:00-1:00 (M-F of backflow week)
Course Number: WET 109
Credits: WET 109 – 01 has 4 credits (five – 8 hour lectures delivered daily for one week and inclass and outside lab activities)
Term Taught: Fall, Winter, Spring, Summer
Day & Time of Course: Lecture/Lab Mon Through Friday 8-4:50 pm, lunch noon-1, additional lab content

Type of Program: Technical - Occupational Preparatory

Class Length: 5 days of continuous content (one week), consisting of five eight hour lectures and additional laboratory activities.

Course Objective: Lecture course with lab component that focuses on backflow assembly hydraulics, operations, installation, and testing.

Required Text: **None**
Textbook: No textbook required. Course reader provided

Water and Environmental Technology Program Learning Outcomes

Students who successfully complete this program will be able to

- Successfully pass the state required level-1 certification exams for Oregon water treatment and distribution and wastewater treatment and collection systems as well as backflow certification.
- Maintain and operate water and waste water treatment facilities and collection and water distribution systems.
- Utilize mathematical skills to solve certification exam problems as well as situations experienced at water and waste water facilities.
- Conduct and document scientific laboratory experiments as applied to the water and wastewater industry and effectively communicate determined quantitative relationships using both graphs and equations.
- Exhibit good teamwork skills and serve as effective members of laboratory and project teams.
- Articulate and justify technical solutions to an audience through oral, written, and graphical communication.
- Communicate the importance of safety in operator daily activities and be good stewards of ethical and professionally work place interactions.

Student Learning Outcomes
1. Explore basic hydraulic concepts: understanding backpressure and backsiphonage.
2. Explain the Venturi effect and Bernoulli's principle.
3. Assess health hazards (biological, chemical, acute and chronic toxicity).
4. Explain how public water systems require protection from cross connection hazards.

5. Discuss the specifications of Reduced Pressure (RP) assemblies installation, maintenance, and repair.
    a. Explain hydraulic and mechanical principles of RP assembly operation.
    b. Explain testing procedures for the RP assembly using a differential pressure gauge.
6. Discuss requirements for backflow device and assembly installation.
    a. Hydraulic and hydrostatic requirements of the Foundation for Cross Connection Control.
7. Discuss the specifications of Double Check (DCV) assemblies installation, maintenance, and repair.
    a. Specifications of DCV assemblies.
    b. Explore hydraulic and mechanical principles of DCV assembly operations.
    c. Explain testing procedures for the DCV assembly using a differential pressure gauge.
8. Explain the role and function of plumbing code for backflow protection.
9. Discuss the specifications of air gap protection.
    a. Applications and limitations of air gap protection.
10. Discuss the specifications of atmospheric vacuum breaker (AVB) devices.
    a. Explore hydraulic and mechanical principles of AVB operation.
    b. Explain installation and use requirements.
11. Discuss the specifications of pressure vacuum breakers (PVB).
    a. Explore hydraulic and mechanical principles of PVB operations.
    b. Explain installation and use requirements.
    c. Explain testing procedures for the PVB assembly using a differential pressure gauge.
12. State exam and hands on proctoring of all assembly test procedures.

Time Commitment:. **Attendance is critical to being a successful student**. Since this is an Oregon Health Authority Certification Class, students must attend all 40 hours of in person training.

<u>Classroom Etiquette:</u> This course is offered by the Oregon Health Authority and attendance is **<u>MANDATORY</u>**! Treat this course like a job/real world work environment! Show up on time and leave when class is over. Be supportive of each other, learn to work in teams, and have fun. Answer your cell phone for emergency purposes only and please walk outside the classroom to do so. You are required to do your own work for this class; its in your best interest to keep a positive growth mindset.

Plagiarism From CCC Student Handbook:

"For the college credit, the instructor may: (1) require the assignment be redone; or (2) issue a failing grade for the assignment on which the cheating or plagiarism occurred; or (3) issue the student a failing grade for the class (CCC student handbook)."

Grading:

1. There will be one final examination given via the 100 question Oregon Health Authority (OHA) Backflow Assembly Certification exam. Scores above 70% can lead to students becoming state certified backflow assembly testers (assuming student submits the necessary OHA paperwork and fees). The score of the final exam is the base point for grade determination. Missed homework assignments or failures on "hands on" practicums will be deducted from the final exam grade to give the final score for the class which is used for final letter grade determination.
2. During the course of this class, you will be required to hand in daily homework assignments, perform random in class "hands on" practicum activities or complete quizzes. Homework assignments are due at the start of class (8am).
3. There will be a total of four "hands on" practicum exams for all four assemblies, failure during the hands on practicum will result in a 5 pt deduction from your final exam test grade.

Backflow Tester Certification 5 Day Course (OAR 333-061-0072)

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

Water & Environmental Technology CLACKAMAS COMMUNITY COLLEGE

Objectives

1. **Understand Requirements for Completion of Course/Certification/Renewal**
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 procedures/installation of backflow prevention devices.**

Oregon Administrative Rules (OAR)

Tester Certification Requirements (333-061-0072)

A. 4.0 College CEU Training

- **Submission of an initial application fee as defined in OAR 333-061.**
- **Submission of proof of high school graduation or equivalent;**
- **Registration with the Construction Contractor's Board or licensure with the Landscape Contractor's Board, as required by ORS 448.279**
- **All Backflow Assembly Tester certificates will expire on June 30 of every odd-numbered year, beginning June 30, 2005 =need to renew!**

Oregon Administrative Rules (OAR)

Tester Certification Requirements (333-061-0072 or 0074)

B. 4.0 CEU of Training

-Hands on demonstration of test procedures Cross Connection Control Manual **USC 9th EDITION*

-Satisfactory completion of all written and physical-performance examinations, including questions specific to OAR 333-061-0070 through 333-061-0073

C. 75% score on 100 question exam

D. 90% score on hands on exam

ROLE OF A TESTER?

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

F. When do you repair a device?
BE CAREFUL!!! TALK WITH WATER PURVEYOR!!!
-REPAIR IS CURRENTLY HANDLED BY: Journeyman plumber or licensed landscape professional with a backflow endorsement

G. WATER PURVEYOR= GOOD PAPERWORK!

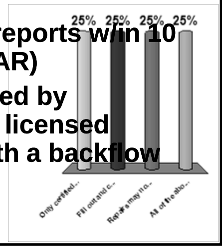
H. Enforcement of Cross Connection Regulations = Water Supplier

ROLE OF A TESTER?

I. Can a tester lose his/her license?
-YES!!!
Falsifying a report, false information, Failed to properly test

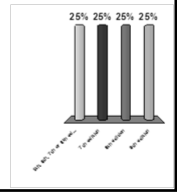
What are the primary responsibilities of the backflow assembly tester?

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 endorsement
4. ☺ All of the above



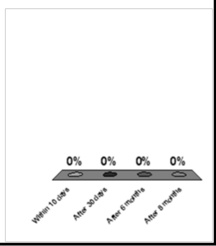
According to OAR (333-061-007); What edition of the USC Foundation For Cross Connection Control Manual is used for hands on testing procedures ?

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



Taken from the **Seatle Post Intellegence** February 17, 1989

Suddenly the toilets start exploding all over the courthouse

By Mary Rothschild
P-I Reporter

It was a flush with a rush.

Toilets and urinals in the King County Courthouse exploded yesterday after a worker in Metro's downtown bus tunnel mistakenly connected an air compressor to the building's water line.

As soon as hapless individuals flushed the pressurized privies, the plumbing started popping in restrooms throughout the 72-year-old building, said building services manager Bill Kemp.

"They started blowing at about 11:30 (a.m.) and it took us a while to figure it out," he recounted. "We knew it had to be air in the system but the Water Department said that was impossible."

It wasn't. The source of the problem was finally tracked to the tunnel under Third Avenue, and the errant air compressor was shut down.

But not before employees on every floor in the 10-story courthouse had stories to tell about gushing geysers in the john.

"We think we've lost about 20 to 25 toilets," said Kemp. "The porcelain is actually cracked."

Kemp said no one has admitted being hurt by the unusual blast, although several people apparently were badly drenched. Or very surprised.

Explained Kemp, "The urinals acted more like bidets. We had other reports that people were not necessarily on the toilet but close."

After the incident, all courthouse restrooms were closed for the day and employees had to walk across the street to the county Administration Building to use the bathroom.

Kemp said most courthouse toilets will be back in operation this morning but, because of possible contamination, drinking water may not be available until Tuesday.

Damages have not yet been estimated, but Kemp said King County will be discussing the matter with Metro and SCI Contractors, the tunnel project's general manager.

"This has not exactly been a good day for Metro," he noted.

THE GLOBE AND MAIL, SATURDAY, FEBRUARY 18, 1989 A3

Ill wind crumbles commodes throughout Seattle courthouse

Associated Press
SEATTLE

About two dozen toilets and urinals in the county courthouse exploded when they were flushed after an air compressor was mistakenly connected to a water line, officials said.

"We think we've lost about 20 to 25 toilets," building services manager Bill Kemp said.

Each time the pressurized privies were flushed in restrooms throughout the 72-year-old building, plumbing started popping, Mr. Kemp said. Instead of the usual swirl and gurgle of water, geysers erupted.

Officials eventually traced the problem to an incorrect compressor hookup done by a construction worker on a nearby bus tunnel project.

Mr. Kemp said there were no reports of injuries, although several people were soaked.

http://www.abpa.org/incidents.htm

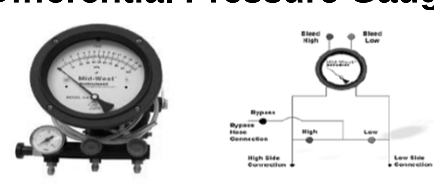
http://www.backflowpreventiontechzone.com/

Oregon Administrative Rules (OAR)

Proof of yearly test gauge calibration will be required for certification renewal.

- **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 for calibration**

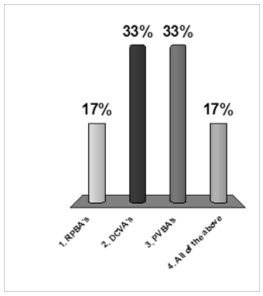
Differential Pressure Gauge



3 Valve Gauge

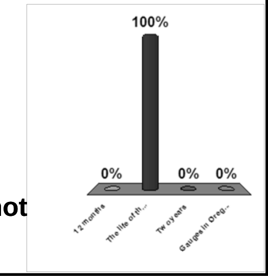
A differential pressure gauge is used to test the following **Assemblies?**

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



Key Words Backflow

4. <u>Cross connection-</u> cross-connection is the link or channel connecting a source of pollution with a potable water supply.

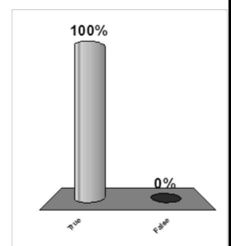
<u>Direct "ACTUAL" cross connection</u> =physically connected plumbed

<u>Indirect "POTENTIAL" cross connection</u> =something has to happen

5. <u>Service Connection-</u> means the piping connection by means of which water is conveyed from a distribution main of a public water system to a user's premise. *For a community water system, the portion of the service connection that conveys water from the distribution main to the user's property line, or to the service meter, where provided, is under the jurisdiction of the water supplier*.

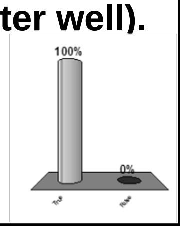
In a cross connection control plan the service connection is typically located at the property line or service meter of a home?

1. True ☺
2. False

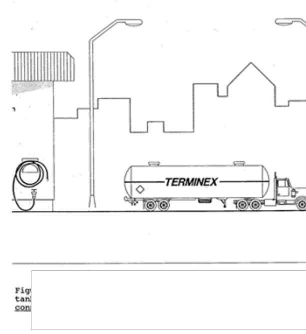


An Auxiliary Water Supply is any supply of water used to augment the supply obtained from the public water system, which serves the premise in question (groundwater well).

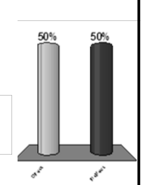
1. True ☺
2. False



Direct or Indirect Cross-connection?



1. Direct
2. Indirect ☺



Key Words Backflow

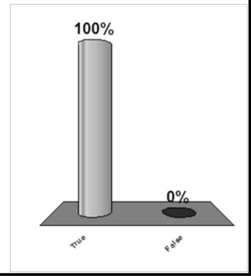
1. Backflow- means the flow of water or other liquids, mixtures, or substances into the distributing pipes of a potable supply of water from any sources other than its intended source, and is caused by backsiphonage or backpressure. Refers to the flow produced by the differential pressure existing between 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.

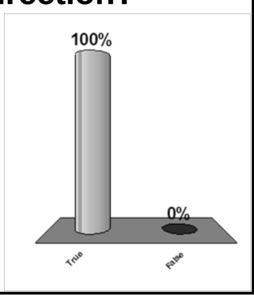
Backpressure and backsiphonage are forces contributing to the reverse flow of water in pipelines

1. True ☺
2. False



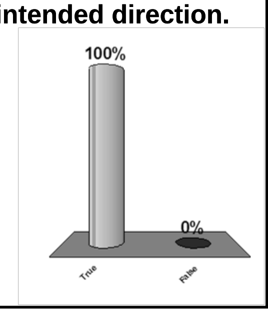
Backpressure occurs when elevated pressure in a system causes water to flow opposite of its intended direction?

1. True ☺
2. False



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.

1. True ☺
2. False



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

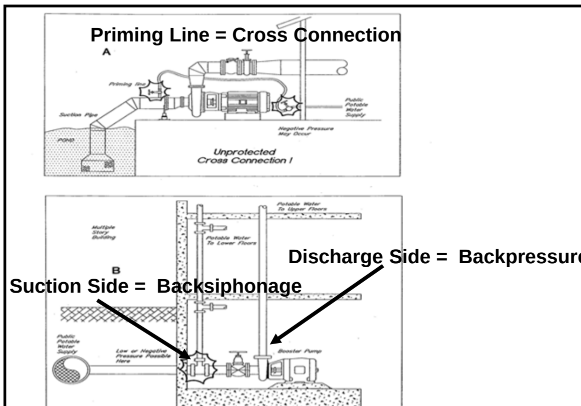
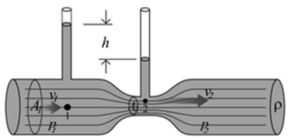


Figure 6. Both of these installations can produce the potential for negative pressure in the potable water supply line.

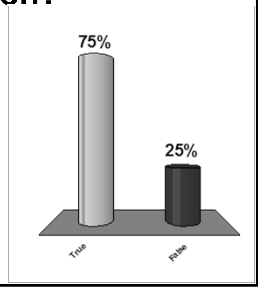
Venturi Effect

- The Venturi effect is a special case of Bernoulli's principle, in the case of fluid or air flow through a tube or pipe with a constriction in it.



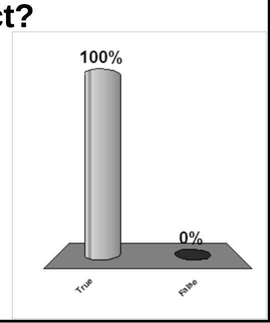
Backpressure can be caused by elevated piping, the discharge side of a pump and thermal expansion?

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

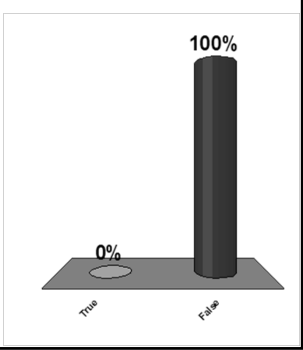
6. Backflow Preventer- means a device, assembly or method to prevent backflow into the potable water system.

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, 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

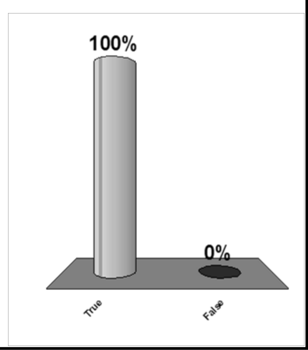
A backflow device can be testable?

1. True
2. False ☺



A backflow assembly is testable?

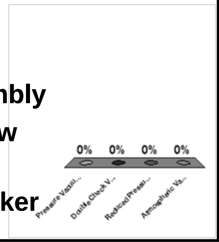
1. True ☺
2. False



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

☺



Dukes of Hazard

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

<u>Low Hazard/pollutant/non-health</u>

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

<u>High hazard/contaminant/health</u>

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

TABLE 32
PREMISES REQUIRING ISOLATION* BY
AN APPROVED AIR GAP
OR
REDUCED PRESSURE PRINCIPLE TYPE OF ASSEMBLY
HEALTH HAZARD

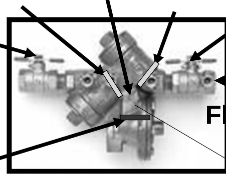
1. Agricultural (e.g. farms, dairies)	12. Metal plating industries
2. Beverage bottling plants**	13. Mortuaries
3. Car washes	14. Petroleum processing or storage plants
4. Chemical plants	15. Piers and docks
5. Commercial laundries and dry cleaners	16. Radioactive material processing plants and nuclear reactors
6. Premises where both reclaimed and potable water are used	17. Wastewater lift stations and pumping stations
7. Film processing plants	18. Wastewater treatment plants
8. Food processing plants	19. Premises with piping under pressure for conveying liquids other than potable water and the piping is installed in proximity to potable water piping
9. Medical centers (e.g., hospitals, medical clinics, nursing homes, veterinary clinics, dental clinics, blood plasma centers)	20. Premises with an auxiliary water supply that is connected to a potable water supply
10. Premises with irrigation systems that use the water supplier's water with chemical additions (e.g., parks, playgrounds, golf courses, cemeteries, housing estates)	21. Premises where the water supplier is denied access or restricted access for survey
11. Laboratories	22. Premises where the water is being treated by

Reduced Pressure Backflow Assemblies

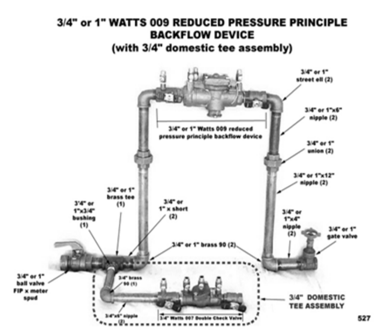
<u>Definition</u> means an assembly containing two independently acting approved check valves, together with a hydraulically operating, mechanically independent pressure differential relief valve located between the check valves and at the same time below the first check valve. The unit shall include 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

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



Reduced Pressure Backflow Assemblies



Reduced Pressure Principle Backflow Prevention Assembly (RP)

Installation OAR 333-061-0071

(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 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

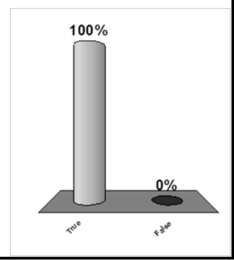
- non-health (low) hazard or health (high) hazard

Conditions

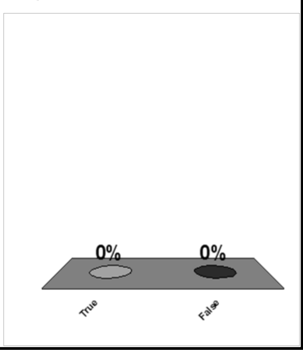
- backsiphonage or backpressure conditions.

An RP contains two check valves and a pressure differential relief valve installed between two shutoff valves ?

☺1. True
2. False

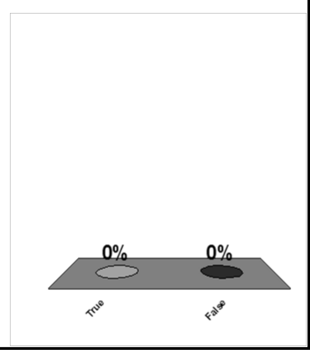


A number 2 check has the heaviest spring in an RP?



1. True
2. False ☺

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



1. True
2. False

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
7. Re-Establish Zone
8. Read and Record Check #1

During the 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
----------------Feed the Leak, Make it Static!------------------
-CREATE CROSS CONNECTION= VERY 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 <u>observed</u> #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—"to see if its naughty or nice"?
-HELL YES!!—IT MAYBE DISC COMPRESSION!

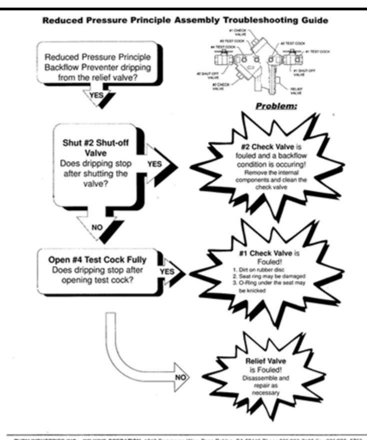
If test #2 of the #2 check fails, you can accurately perform a test #3 of the number one check?

-No WAY!—LIABILITY—TEST REPORT FORM!

Other Problems During Test #1 of RP assembly (The relief port). What is the proper response?

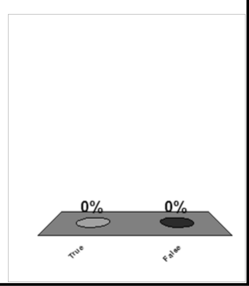
Relief Valve would not open, test gauge needle does not continue to drop
Excessive #2 shut-off leak, with flow through the assembly. FLOW MAKES GAUGE READ HIGH! Have to get it static for a good test!
- Relief Valve would not open, test gauge drops to zero.
Relief Valve stuck shut, Failing Relief valve but you can continue with other tests

- Buffer to low (less than 3 psid minimum)--Relief Valve opens too high / #1 check pressure drop too low. Did Check #1 hold when shut-off #2 closed?



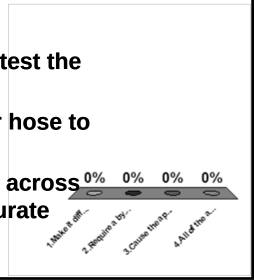
Shut-off valves #1 and #2 are closed in order to properly test an RP ?

1. True
2. False ☺



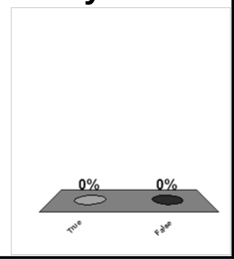
When testing the RPBA a leaking #2 shut-off with flow through the assembly will:

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



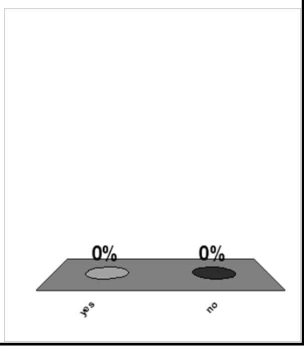
If check valve number one on a reduced pressure principle backflow prevention assembly is leaking, you can complete the test on that assembly ?

1. True
2. False ☺



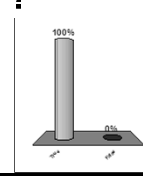
Can a number 2 check leak in a passable RP assembly?

1. yes
2. no ☺



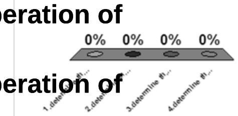
A steady discharge of water from the relief valve of a RP device can be a defect in the first check or in the relief valve or backpressure backflow occurring through a leaking second check valve ?

1. True ☺
2. False



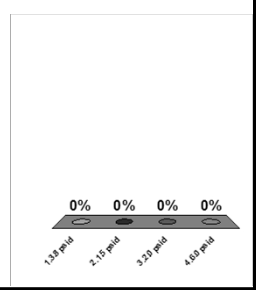
The purpose of the number one test on an RP assembly is to:

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



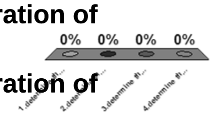
Which of the following gauge readings indicates failure of the relief valve when testing?

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



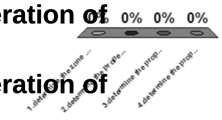
The purpose of the number two test on an RP assembly is to:

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



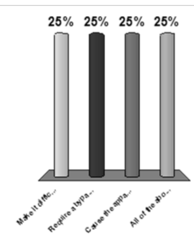
The purpose of the number three test on an RP assembly is to:

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



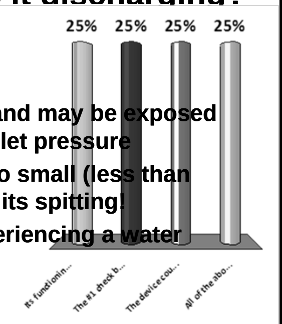
When testing the RPBA a leaking #2 shut-off with flow through the assembly will:

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



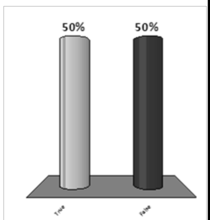
You are called to test an intermittently discharging RP Assembly, why is it discharging?

1. Its functioning properly and may be exposed to large fluctuations in inlet pressure
2. The #1 check buffer is too small (less than the required 3 psid) thus its spitting!
3. The device could be experiencing a water hammer
4. All of the above



If the #2 check fails during test #2 you must check it twice!!!!!!!

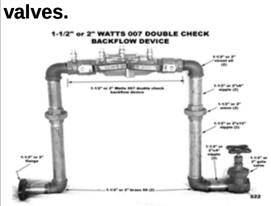
1. True ☺
2. False



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.

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

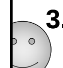
b. Flow from the #3 test cock sight tube cannot be adjusted to a slight drip.
-Excessive shutoff leaks (maybe shutoff #1 or #2)

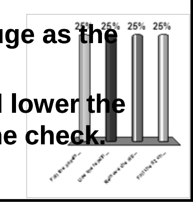
c. Flow stops from the bleed valve, but continues from the sight tube. -use that recorded value!!!

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

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

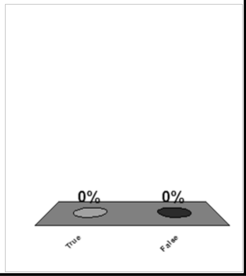
1. Fail the assembly, the #2 s/off is leaking.
2. Use the reading on the gauge as the #2 check value.
3. Remove the sight tube and lower the gage to the centerline of the check.
4. Fail the #2 check.





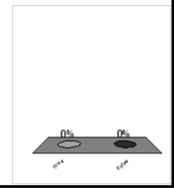
A DCVA works well against backpressure and backsiphonage and high hazard conditions?

1. True
2. False ☺



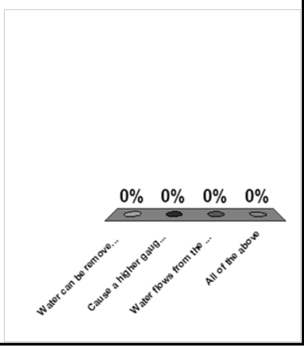
A double check valve assembly backflow preventer is tested with only the number two shut-off valve closed ?

1. True
2. False ☺



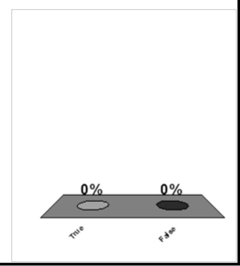
A leak in the #1 shut off valve of a DCVA will?

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



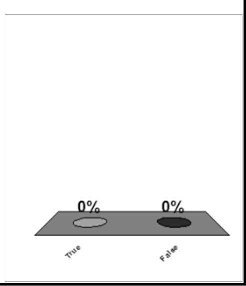
You must install a bleed valve as part of the test procedure when testing a double check valve assembly?

1. True ☺
2. False



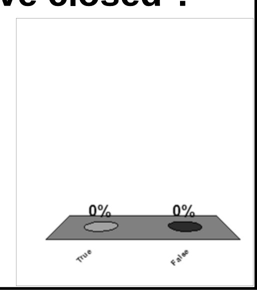
Backflow from a plating tank containing arsenic is properly prevented by the installation of a double check valve assembly ?

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 ☺



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

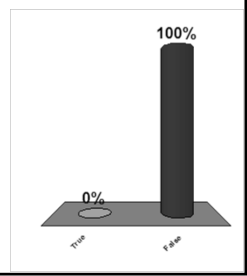
Atmospheric Vacuum Breaker (AVB)

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

Conditions
•Be used to protect against backsiphonage only, not backpressure.

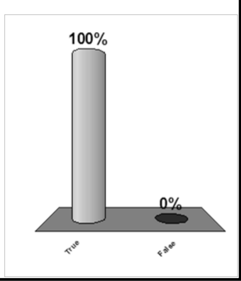
An atmospheric vacuum breaker must be installed six inches above the downstream shut-off valve ?

1. True
2. False



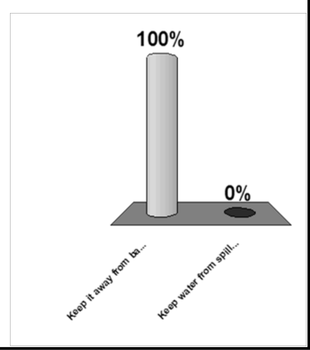
An atmospheric vacuum breaker must be installed six inches above the highest piping of the system ?

1. True
2. False



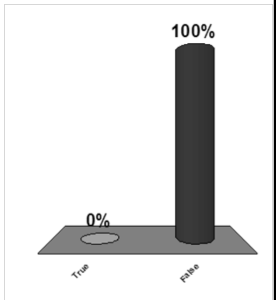
Why do we install an AVB or a PVB at the highest point of use?

1. Keep it away from backpressure
2. Keep water from spilling onto lower pipes



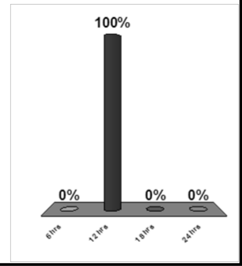
Its okay to install an AVB in a closed room with a toxic (corrosive gas) like chlorine?

1. True
☺2. False



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

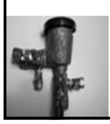
1. 6 hrs
☺2. 12 hrs
3. 18 hrs
4. 24 hrs

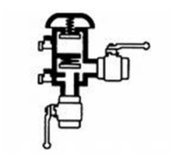


Pressure Vacuum Breaker (PVB)

<u>Definition</u>- **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.**

<u>Parts and Components</u> One spring loaded check valve and an atmospheric vent.






Pressure Vacuum Breaker (PVB)

<u>Installation</u>

(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)

<u>Protection</u>

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

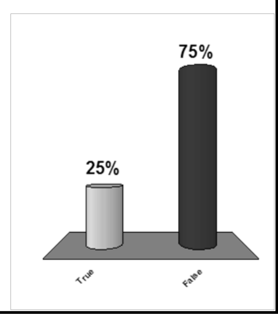
<u>Conditions</u>

•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

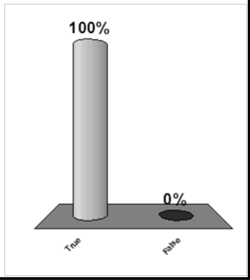
A pressure type vacuum breaker works well to protect against backpressure?

1. True
☺2. False



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



Air Gap (AG)

<u>Parts and Components</u> - means a physical separation between the freeflowing discharge end of a potable water supply pipeline and an open or nonpressurized receiving vessel

Air Gap (AG)

<u>Installation</u>

(a) An "Approved Air Gap" shall be at least twice the diameter of the supply pipe measured vertically above the overflow rim of the vessel and in no case less than 1 inch (2.54 cm), and in accord with Oregon Plumbing Specialty Code

Air Gap (AG)

<u>Protection</u>

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

<u>Conditions</u>

•backsiphonage or backpressure conditions.

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 OF 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!

<u>Permit Required Confined Spaces</u>

"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**

<u>Test before you enter-</u> 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.

•<u>Tester Role in Confined Spaces</u>
•Your Life is at Stake---
•IDENTIFY IF IT'S A CONFINED SPACE
• YOU MAY NEED A PERMIT-Get Trained!!

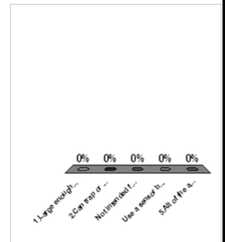
Tester's Role in Safety!

<u>Safety</u>

- CONFINED SPACE ENTRY!
- First aid
- MSDS reports (hazardous chemicals)
- Electrical Safety
- <u>Lockout-Tagout (LOTO)-</u> 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)).

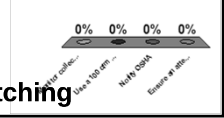
What characteristics define a confined space?

1. Large enough 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



The objectives for written portion of today's material: to become familiar with the role of a tester in the State of Oregon; understand use/function/test procedures/installation of backflow prevention devices and safety has been met?

1. Strongly Agree
2. Agree
3. Neutral
4. Disagree
5. Strongly Disagree