

* SMALL PUBLIC WATER SYSTEM CROSS CONNECTION CONTROL PROGRAM DEVELOPMENT



American Water Works Association
Pacific Northwest Section

PNWS-AWWA SPRING CONFERENCE - MAY 2nd

Presented by:

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&

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Created by Terry Pickel



* **SMALL PUBLIC WATER SYSTEM CROSS CONNECTION
CONTROL PROGRAM DEVELOPMENT**



**SPONSORED BY – PNWS-AWWA CROSS
CONNECTION CONTROL COMMITTEE**

Schedule: 10:15 to 10:45

CEU's: .05 ASSIGNED

* SMALL PUBLIC WATER SYSTEM CROSS CONNECTION CONTROL PROGRAM DEVELOPMENT



Discuss initial development of a program:

- * Why is it necessary?
- * What must happen first?
- * What do you need to know?
- * Who must be involved?

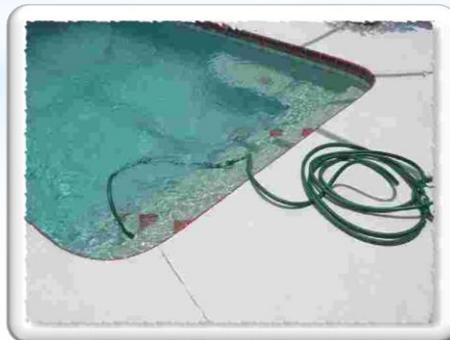


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What is the definition of a “cross-connection”?

* *A cross connection as defined in the AWWA PNWS Cross-Connection Control Manual as:*

Any “actual or potential” connection or structural arrangement between a public or a consumer’s potable water system and any other source or system through which it is possible to introduce into any part of the potable water system any used water, industrial fluid, gas, or substance other than the intended potable water with which the system is supplied. Bypass arrangements, jumper connections, removable sections, swivel or change-over devices and other temporary or permanent devices through which or because of which backflow can occur are considered to be cross-connections.





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BACKFLOW CAN OCCUR AS EITHER BACKPRESSURE OR BACKSIPHONAGE

- * As a basics of hydraulics, water will always flow to the path of least resistance, i.e. from higher pressure to lower pressure.

Back Siphonage

Reverse flow caused by a loss of supply pressure

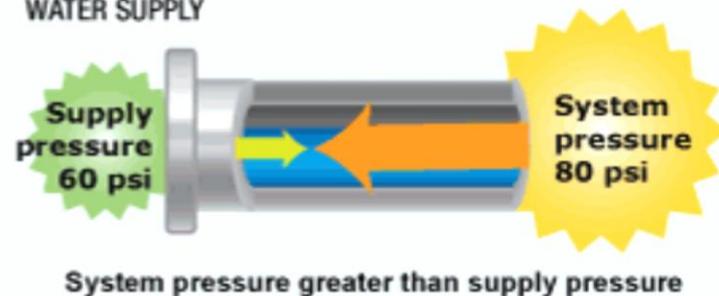
WATER SUPPLY



Back Pressure

An increase in water pressure caused by elevation or mechanical pumping that raises the system pressure above the supply pressure

WATER SUPPLY

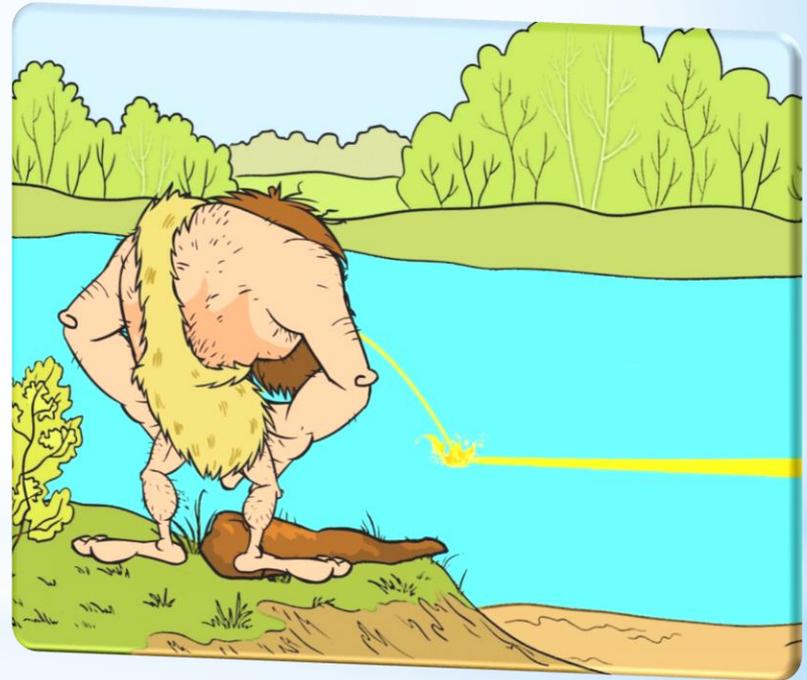




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Why is cross-connection control important?

- * **Protection of the public health**
- * Public water system protection
- * Ensure regulatory compliance
- * Help identify customers with the “potential” to introduce contaminants into the public water supply





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What will it do for my customer?

- * **Protects your customers, family, friends and neighbors**
- * Ensures good water quality
- * Does it make them happy?
- * Will it cost them money?





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Washington Regulations

- * WAC 246-292-010 – Definitions (37)
- * WAC 246-292-033 – Duties of a CCS (5)
- * WAC 246-292-034 – Duties of a BAT (8)
- * WAC 246-292-036 – Field Test Report
- * WAC 246-290-490 – Cross Connection Control (8 elements of Rule & 10 elements of a program)



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Washington - Current revisions in progress:

- * Backflow Assembly Reference Manual – Nearly Complete
- * Small Public Water System Cross Connection Control Manual – Update in Progress
- * Backflow Incident Manual – Scheduled to be Updated



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Department of Health (DOH)	Washington
Group A Community Water System -	>15 connections or > 25 people for >180 days/year
Group A Non-Community - # of people	Any system that is not a community system - NTNC or TNC
Group B - # of service connections	< 15 connections and <25 people/day Or >25 people/day for < 60 days/year



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Idaho Regulations

- * **IDAPA 58.01.08 Section 003: covers basic definitions as well as references of the Rule.**
- * **IDAPA 58.01.08 Section 543: covers the Facility and Design Standards**
- * **IDAPA 58.01.08 Section 552: details Operating Criteria for Public Water Systems**
- * **IDAPA 24.05.01 covers Operator Requirements including BAT responsibilities and Code of Conduct**



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Department of Environmental Quality (DEQ)	Idaho
Community Water System - Approx.	>15 connections or > 25 people year-round
Non-Transient Non-Community Water System -	>25 same persons > 6 mos/year
Transient Non-Community Water System -	>25 different persons < 6 mos/year



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Oregon Regulations

- * OAR 333-061-0070 - CCC Req.
- * OAR 333-061-0071 - BFA Install Stds
- * OAR 333-061-0072 – BAT Certification
- * OAR 333-061-0073 – CCS Certification
- * OAR 333-061-0074 – CCC Training and Instructor Certification Requirements



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CONTROL PROGRAM DEVELOPMENT**

Oregon Health Authority (OHA)	Oregon
Community Water System -	>15 connections or > 25 people year-round
Non-Transient Non-Community Water System -	>25 same persons > 6 mos/year
Transient Non-Community Water System -	>transient population of 25 or more different persons



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Purveyor Responsibilities?

What must I do as a purveyor?

- * Know your specific requirements for your system classification.
- * Will you need a CCS? Operator? Tester?
- * Do you have an ordinance, bylaw or policy in place?
- * There are annual reporting requirements in Washington and Oregon but none in Idaho
- * You do need to report confirmed incidents immediately!
- * Education, education, education!





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Application

Where is backflow protection required?

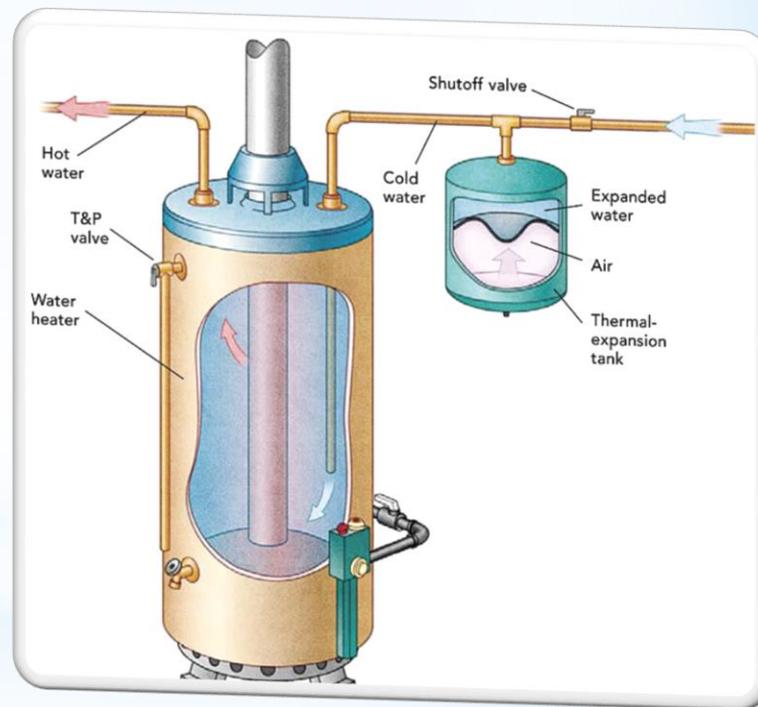
- * What type of program will you have?
- * Review Hazard Table requirements.
- * Commercial/industrial facilities?
- * Medical facilities?
- * Multifamily complexes?
- * What about residential?



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BACKPRESSURE- THERMAL EXPANSION

- * Backpressure can be caused by a relatively common factor called thermal expansion.
- * This occurs when water is heated such as in a hot water tank or boiler where the pressures in the customers water system can become higher than supply system pressure without a relief potential

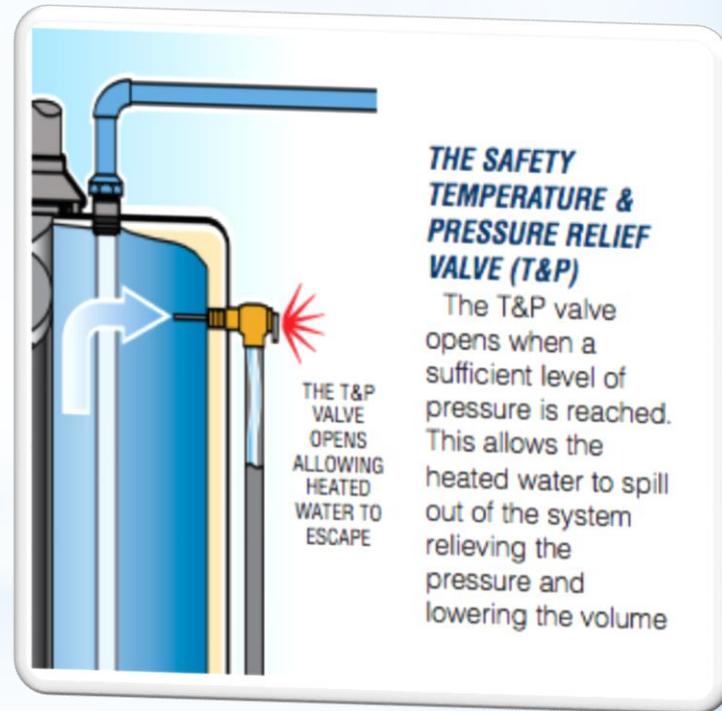




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BACKPRESSURE-T&P VALVE

- * Backpressure in the form of thermal expansion can be caused by a stuck T&P valve on a water heater.
- * Without a Thermal Expansion Tank, this can result in property damage and a potential explosion.





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BACKSIPHONAGE

- * Here are just a few examples of how a residential service can experience backsiphonage.
- * Notice the main residential offender? Ye olde garden hose!
- * The average person would not even think twice about it.

WHEN A DROP IN WATER PRESSURE TAKES PLACE, CHEMICALS OR DIRTY WATER CAN BE SUCKED BACKWARDS INTO YOUR HOUSEHOLD PLUMBING SYSTEM.

EXAMPLE

GARDEN HOSE CONNECTED TO A HOME FERTILIZER SPRAYER, A HOSE CONNECTED TO A SLOP SINK AND A GARDEN HOSE USED TO FILL A SWIMMING POOL





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TYPES OF PROTECTION

TYPES OF PROTECTION:

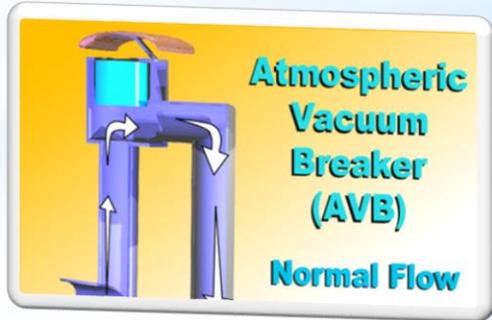
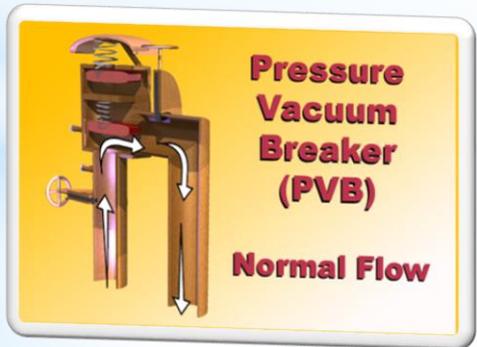
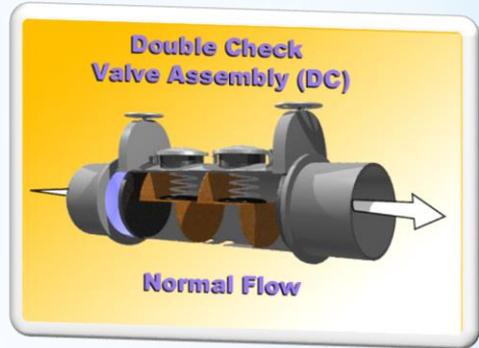
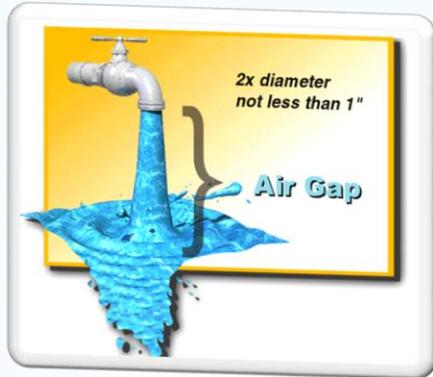
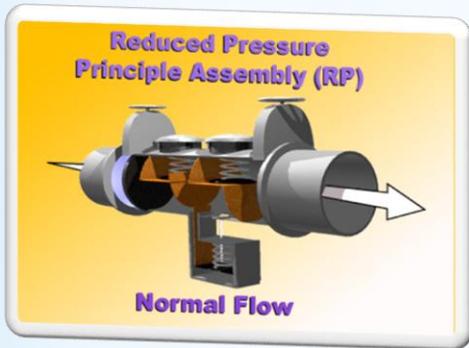
- * There are several methods of protection dependent on the degree of hazard.
- * These range from the most severe to the basic protection levels

Five Means of Preventing Backflow

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

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TYPES OF PROTECTION



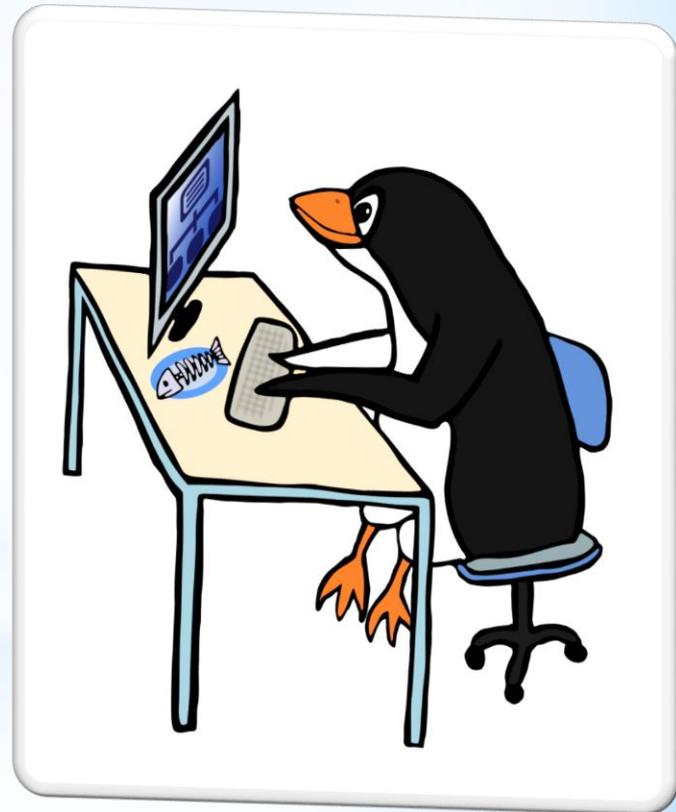


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Basics of Programs

Why have a CCC Program?

- * Cross-connection control programs are mandatory for public water systems in Washington, Oregon and Idaho.
- * Cross-connection control is the most prudent and cost effective method for protection of the public health.
- * Cross connections have caused more waterborne disease outbreaks in the U.S. than any other reported factor.



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Basics of Programs

What is absolutely required?

- * You need a program!
- * Premise Isolation vs In-plant fixture protection?
- * Inspections?
- * Recordkeeping and reporting?
- * Public and Administrative Education?
- * Notification?
- * Testing requirements?



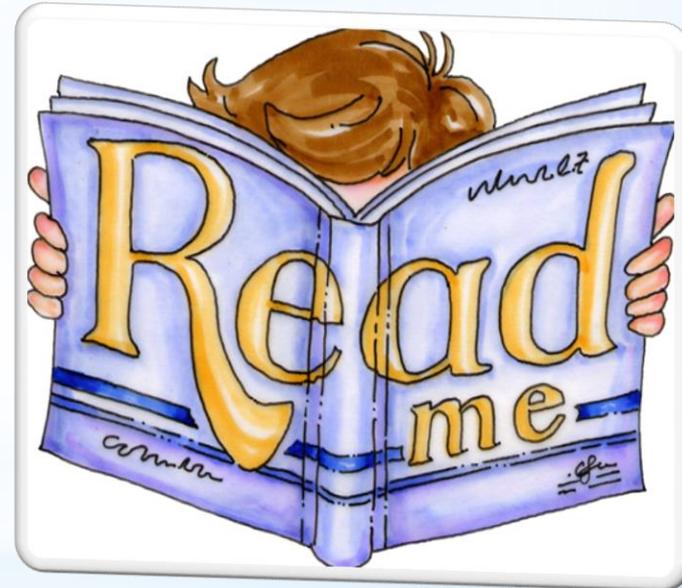


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System Programs

What resources are available?

- * Your state regulators!
- * PNWS-AWWA CCC Committee and other regional committees!
- * USC-FCCCHR 10th Edition.
- * Other CCS's and operators?
- * What about testers?



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Where do I begin?

As Operators and Cross-Connection Control Specialists, you will need to have:

- * A thorough working knowledge of the basics of cross-connection control;
- * Basic theory of water system hydraulics;
- * A working knowledge of regulatory requirements;
- * Recordkeeping abilities;
- * And a knowledge of backflow assembly testing procedures.



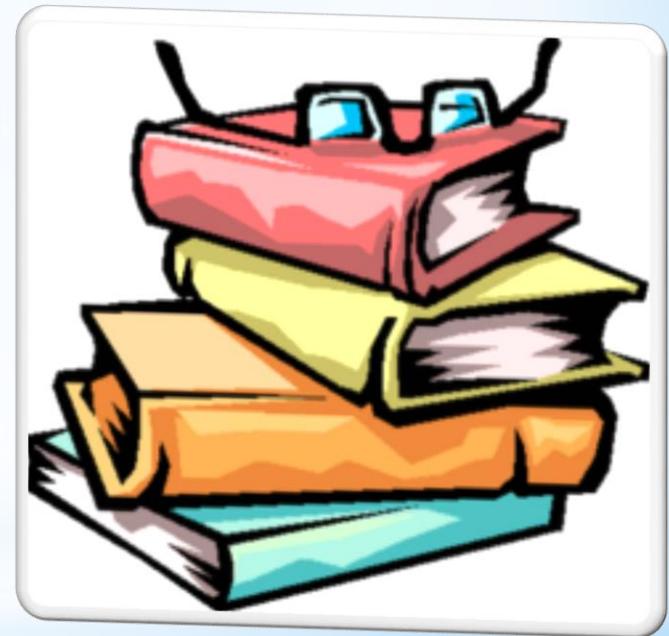


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Where do I begin?

In order to develop or run a cross-connection control program you will need:

- * 1. First and foremost, you will need to be certified operators.
- * Also, in the states of Washington and Oregon, only a certified Cross Connection Specialist (CCS) may run a program.
- * In Idaho, an operator may run the program.





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Program Requirements

In order to develop or run a cross-connection control program you will need:

- * 2. A Cross-Connection Control Ordinance, Code, Policy or Bylaws.
- * These should spell out your specific guidelines and determine suitable methods to protect your system.

D R A F T

ORDINANCE NO. [REDACTED]
COUNCIL BILL NO. [REDACTED]

AN ORDINANCE AMENDING THE MUNICIPAL CODE OF THE CITY OF COEUR D'ALENE, KOOTENAI COUNTY, IDAHO, AMENDING [REDACTED]; REPEALING ALL ORDINANCES AND PARTS OF ORDINANCES IN CONFLICT HEREWITH; PROVIDING A SEVERABILITY CLAUSE; PROVIDE FOR THE PUBLICATION OF A SUMMARY OF THIS ORDINANCE AND AN EFFECTIVE DATE HEREOF.

WHEREAS, after public hearing on the hereinafter provided amendments, and after recommendation by the [REDACTED], it is deemed by the Mayor and City Council to be in the best interests of the City of Coeur d'Alene that said amendments be adopted; NOW, THEREFORE,

BE IT ORDAINED, by the Mayor and City Council of the City of Coeur d'Alene:

SECTION 1. That Coeur d'Alene Municipal Code Section 13.24.010 is amended to read as follows:

13.24.010: PURPOSE:

The purpose of this Chapter is to protect the public health and welfare by controlling cross-connections or other known sources or potential sources of contamination to the City water supply.

SECTION 2. That a new Section 13.24.015, entitled *Applicability*, is added to the Coeur d'Alene Municipal Code as follows:

13.24.015: APPLICABILITY:

The provisions of this Chapter apply to all customers of the City of Coeur d'Alene's water system.

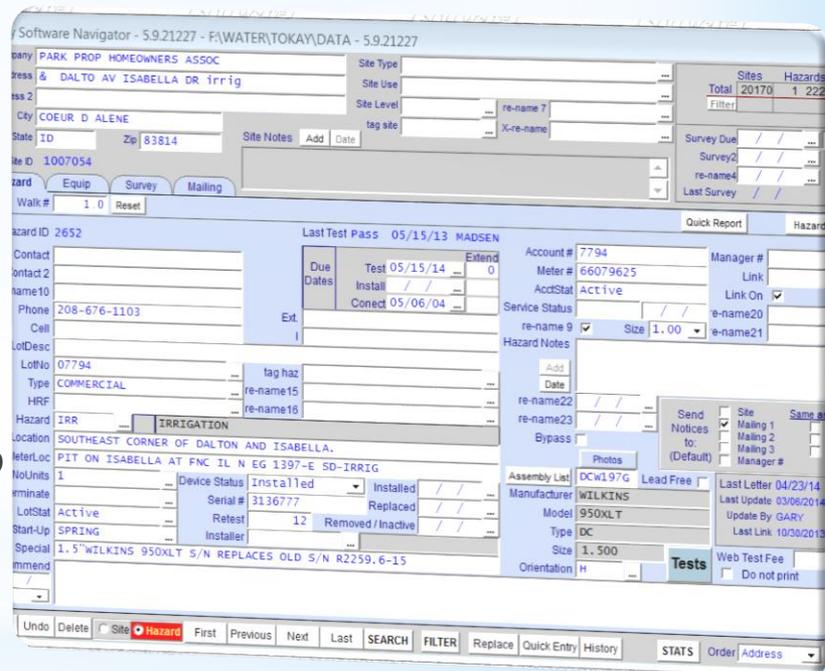
SECTION 3. That Coeur d'Alene Municipal Code Section 13.24.020 is amended to read as follows:

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Program Requirements

In order to develop and run a cross-connection control program you will need:

- * 3. Software for record keeping.
- * Typically an established software is easier to set up and use and is compatible with your billing system to facilitate service record downloads.
- * But you can develop your own.





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Program Requirements

In order to develop or run a cross-connection control program you will need:

- * 4. Dedicated personnel for data entry, record keeping and inspections.
- * Unfortunately, this is usually not staffed to the necessary levels.

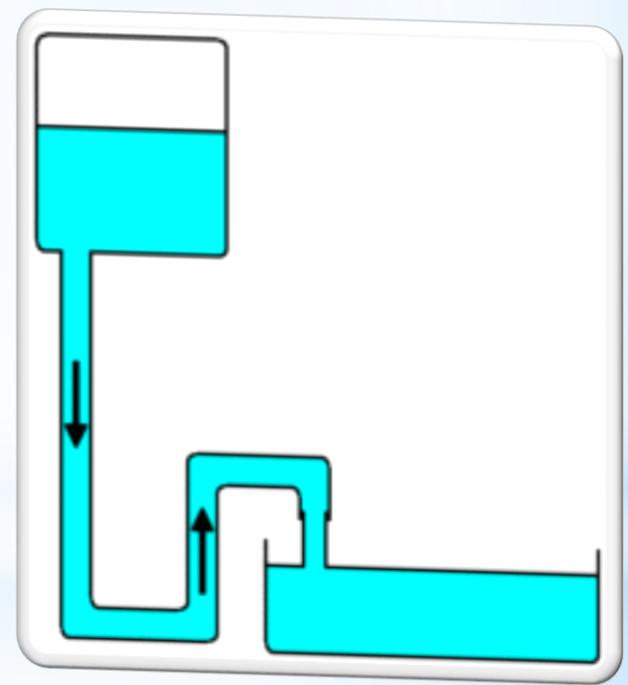


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Program Requirements

In order to develop or run a cross-connection control program you will need:

- * 5. Must have a good working knowledge of hydraulics and theories of cross-connection control to help educate customers and testers as well as inspect facilities.





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Program Requirements

In order to develop or run a cross-connection control program you will need:

- * 6. Dialog with system approved testers and adequate knowledge of testing procedures.
- * The testers need to know what you expect of them.

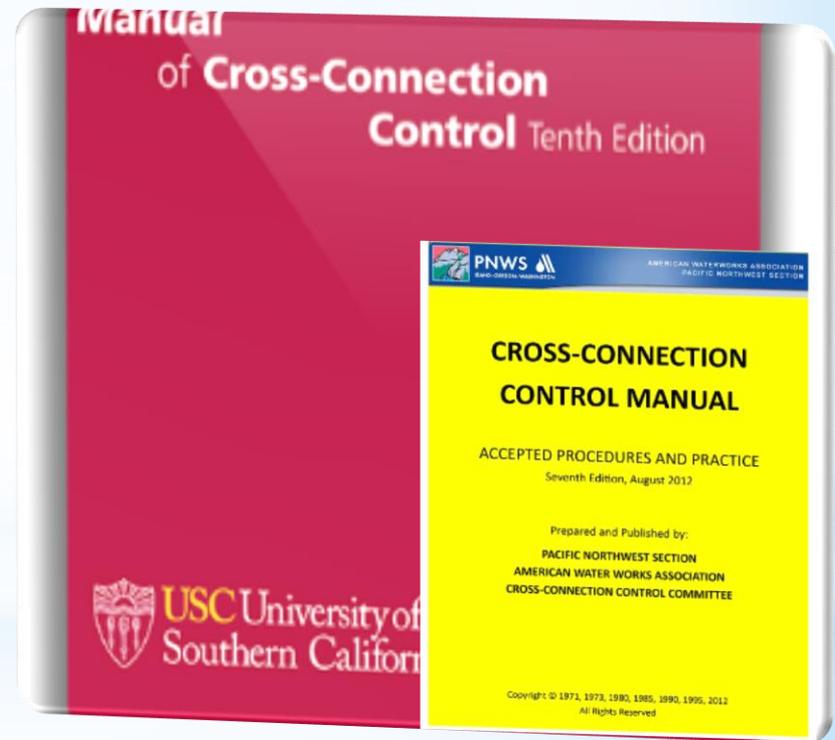


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Program Requirements

In order to develop or run a cross-connection control program you will need:

- * 7. Copies of the USC FCCCHR 10th Edition Manual and the PNWS Cross Connection Control Manual 7th Edition.
- * Testing procedures are outlined in this manual, pursuant to annual updates.
- * Referenced by Washington, Idaho and Oregon.

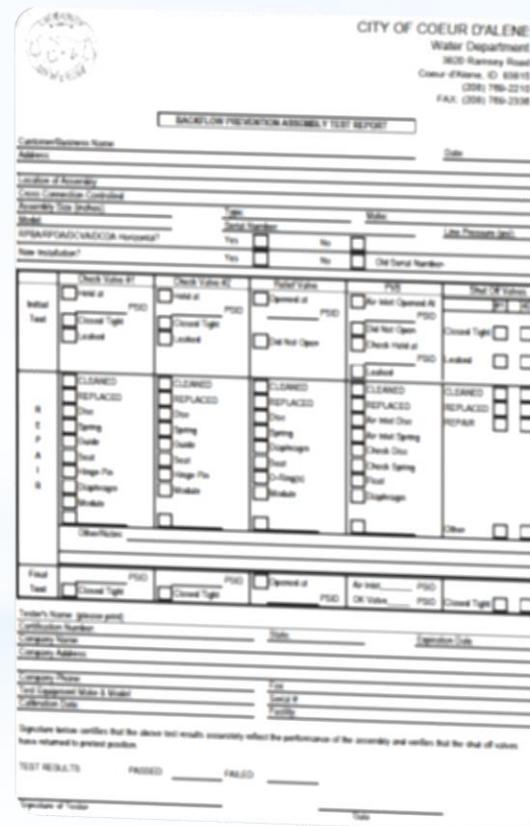


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Program Requirements

In order to develop or run a cross-connection control program you will need:

- * 8. To develop or adopt an approved Test Report Form.
- * There are plenty of examples available acceptable to DOH, DEQ and OHA.



CITY OF COEUR D'ALENE
Water Department
803 Ramsey Road
Coeur d'Alene, ID 83814
(208) 766-2210
FAX: (208) 766-2338

BACKFLOW PREVENTION ASSEMBLY TEST REPORT

Customer/Assembly Name: _____ Date: _____
Address: _____
City: _____ State: _____
Assembly Type: _____
PSD: _____
PSD Model Number: _____
PSD Serial Number: _____
PSD Manufacturer: _____
PSD Date of Installation: _____
PSD Test Date: _____

Valve	Check Valve	PSD	Spring	Diaphragm	Other
A	<input type="checkbox"/> Checked <input type="checkbox"/> Leaked <input type="checkbox"/> Failed	<input type="checkbox"/> PSD <input type="checkbox"/> Checked <input type="checkbox"/> Leaked <input type="checkbox"/> Failed	<input type="checkbox"/> Spring <input type="checkbox"/> Checked <input type="checkbox"/> Leaked <input type="checkbox"/> Failed	<input type="checkbox"/> Diaphragm <input type="checkbox"/> Checked <input type="checkbox"/> Leaked <input type="checkbox"/> Failed	<input type="checkbox"/> Other <input type="checkbox"/> Checked <input type="checkbox"/> Leaked <input type="checkbox"/> Failed
B	<input type="checkbox"/> Checked <input type="checkbox"/> Leaked <input type="checkbox"/> Failed	<input type="checkbox"/> PSD <input type="checkbox"/> Checked <input type="checkbox"/> Leaked <input type="checkbox"/> Failed	<input type="checkbox"/> Spring <input type="checkbox"/> Checked <input type="checkbox"/> Leaked <input type="checkbox"/> Failed	<input type="checkbox"/> Diaphragm <input type="checkbox"/> Checked <input type="checkbox"/> Leaked <input type="checkbox"/> Failed	<input type="checkbox"/> Other <input type="checkbox"/> Checked <input type="checkbox"/> Leaked <input type="checkbox"/> Failed
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E	<input type="checkbox"/> Checked <input type="checkbox"/> Leaked <input type="checkbox"/> Failed	<input type="checkbox"/> PSD <input type="checkbox"/> Checked <input type="checkbox"/> Leaked <input type="checkbox"/> Failed	<input type="checkbox"/> Spring <input type="checkbox"/> Checked <input type="checkbox"/> Leaked <input type="checkbox"/> Failed	<input type="checkbox"/> Diaphragm <input type="checkbox"/> Checked <input type="checkbox"/> Leaked <input type="checkbox"/> Failed	<input type="checkbox"/> Other <input type="checkbox"/> Checked <input type="checkbox"/> Leaked <input type="checkbox"/> Failed

Final Test: PSD Checked Tight Spring Diaphragm Other OK No Test

Customer's Name: _____
Company Name: _____
Company Address: _____
City: _____ State: _____
Zip: _____
Telephone: _____
Fax: _____
E-mail: _____

Signature below certifies that the above test results accurately reflect the performance of the assembly and certifies that the shut off valves have returned to proper position.

TEST RESULTS: PASSED _____ FAILED _____

Signature of Tester: _____ Date: _____

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CONTROL PROGRAM DEVELOPMENT**

Program Requirements

In order to develop or run a cross-connection control program you will need:

- * **9.** Lots of dedicated file space.
- * You will need to determine whether to support electronic records with hardcopies.
- * There are advantages and disadvantages of both.





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Program Requirements

In order to develop or run a cross-connection control program you will need:

- * **10.** Adequate training on how to conduct site inspections.
- * It is helpful to get a set of mechanical drawings or work with a building maintenance representative.
- * And two pairs of eyes are always better than one.





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Program Requirements

In order to develop or run a cross-connection control program you will need:

- * 11. Ability to do plan reviews looking for potential hazards.
- * You should be doing plan reviews on all new commercial and industrial facilities.





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Program Requirements

Incident response and investigation plan:

- * **12.** Establish an incident reporting and investigation response plan.
- * You should be doing plan reviews on all new commercial and industrial facilities.





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Program Requirements

Education is key to a successful cross-connection control program.

- * **13.** You will need to educate your Council or Board.
- * You will need to educate your system managers.
- * You will need cooperation from your plumbing inspectors, educate them.





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Never Fear, Help is Here!

Cooperation

- * In setting up and running a successful program, you will need to solicit the assistance of management, the plumbing and building inspectors, the Fire Dept., your fellow operators, testers and especially your customers.





* SMALL PUBLIC WATER SYSTEM CROSS CONNECTION CONTROL PROGRAM DEVELOPMENT

Inexpensive Materials

Education is key to a successful cross-connection control program.

- * As Public Water System operators, you need to understand the importance of cross-connection control.
- * **Protection of the public health is your primary responsibility.**

What is a Cross Connection?

A cross connection is a point in a plumbing system where the potable water supply is connected to a non-potable source. Briefly, a cross connection exists whenever the drinking water system is or could be connected to any non-potable source (plumbing fixture, equipment used in any plumbing system). Pollutants or contaminants can enter the safe drinking water system through uncontrolled cross connections when backflow occurs.

Backflow is the unwanted flow of non-potable substances back into the consumer's plumbing system and/or public water system (i.e., drinking water).

There are two types of backflow: **backsiphonage** and **backpressure**. **Backsiphonage** is caused by a negative pressure in the supply line to a facility or plumbing fixture. Backsiphonage may occur during waterline breaks, when repairs are made to the waterlines, when shutting off the water supply, etc.

Backpressure can occur when the potable water supply is connected to another system operated at a higher pressure or has the ability to create pressure. Principal causes are booster pumps, pressure vessels and elevated plumbing.

Backflow preventers are mechanical devices designed to prevent backflow through cross connections. However, for backflow preventers to protect as designed, they must meet stringent installation requirements.

For further information contact your local water purveyor or the PNWS/AWWA Cross-Connection Control Committee through the PNWS office at (877) 767-2992 or on the web at www.pnws-awwa.org

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Cross Connections can create Health Hazards

Drinking water systems may become **Polluted** or **Contaminated** through uncontrolled cross connections

American Water Works Association
Pacific Northwest Section



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Inexpensive Materials

Education is key to a successful cross-connection control program.

* As Operators and/or Cross-Connection Specialists running a Cross-Connection Control Program, your job will be to educate your customers to the dangers of cross connections.

Why Be Concerned?

Most water systems in the United States and Canada have good sources of water and/or sophisticated treatment plants to convert impure water to meet drinking water standards. Millions of dollars are spent to make the water potable before it enters the distribution system so most water purveyors think that their supplies are not in jeopardy from this point on. Studies have proven this to be wrong. Drinking water systems may become polluted or contaminated in the distribution system through uncontrolled cross connections.

Cross connections are installed each day in the United States because people are unaware of the problems they can create. Death, illness, contaminated food products, industrial and chemical products rendered useless are some of the consequences of such connections. As a result, many hours and dollars are lost due to **cross connections**.

Where are Cross Connections Found?

Cross connections are found in all plumbing systems. It is important that each cross connection be identified and evaluated as to the type of backflow protection required to protect the drinking water supply. Some plumbing fixtures have built-in backflow protection in the form of a physical air gap. However, most cross connections will need to be controlled through the installation of an approved mechanical backflow prevention device or assembly. Some common cross connections found in plumbing and water systems include:

1. Wash basins and service sinks.
2. Hose bibs.
3. Irrigation sprinkler systems.
4. Auxiliary water supplies.
5. Laboratory and aspirator equipment.
6. Photo developing equipment.
7. Processing tanks.
8. Boilers.
9. Water recirculating systems.
10. Swimming pools.
11. Solar heat systems.
12. Fire sprinkler systems.

Every water system has cross connections. Plumbing codes and State drinking water regulations require cross connections to be controlled by approved methods (physical air gap) or approved mechanical backflow prevention devices or assemblies. The various types of mechanical backflow preventers include: reduced pressure backflow assembly (RPBA), reduced pressure detector assembly (RPDA), double check valve assembly (DCVA), double check detector assembly (DCCA), pressure vacuum breaker assembly (PVBA), spill resistant vacuum breaker assembly (SVBA) and atmospheric vacuum breaker (AVB).

For a backflow preventer to provide proper protection, it must be approved for backflow protection, designed for the degree of hazard and backflow it is controlling, installed correctly, tested annually by a State certified tester, and repaired as necessary. Some states require mandatory backflow protection on certain facilities where high health-hazard-type cross connections are normally found. The following is a partial list of those facilities:

1. Hospitals, mortuaries, clinics.
2. Laboratories.
3. Food and beverage processing centers.
4. Metal plating and chemical plants.
5. Car washes.
6. Petroleum processing and storage plants.
7. Piers and docks.
8. Sewage treatment plants.

What to Do?

It is impossible to cover all of the information pertaining to cross connections in a pamphlet. We hope the preceding information will inspire you to further educate yourself on the hazards of unprotected cross connections. Cross connection control manuals and training schools are offered throughout the Northwest. Information on manuals, schools and cross connection control can be obtained from:

Washington
 Department of Health
 Industrial Way, Bldg. 3
 P.O. Box 47822
 Olympia WA 98504-7822
 (360) 236-3133

Oregon
 Oregon Health Division
 3420 Cherry Av NE, #110
 Keizer OR 97303
 (503) 373-7201

British Columbia, Canada
 BC Water & Waste Association
 Site, 342 - 17 Fawcett Road
 Coquitlam B.C. V3K 6V2
 (604) 540-0111

Idaho
 Idaho Division of Environment
 1410 N Hillon
 Boise ID 83706
 (208) 373-0275

Additional sources of information may be found on the PNWS-AWWA web site:
www.pnws-awwa.org

Wrong:
Uncontrolled Cross Connection

Right:
Controlled Cross Connection



* SMALL PUBLIC WATER SYSTEM CROSS CONNECTION CONTROL PROGRAM DEVELOPMENT

Facility Inspections

YOU NEVER KNOW WHAT YOU WILL COME ACROSS.

- * Digital camera - photos are invaluable.
- * Laptop or tablet may be helpful if available.
- * Clip board and materials for taking notes.
- * Site survey checklist.
- * Records of existing assemblies and locations.

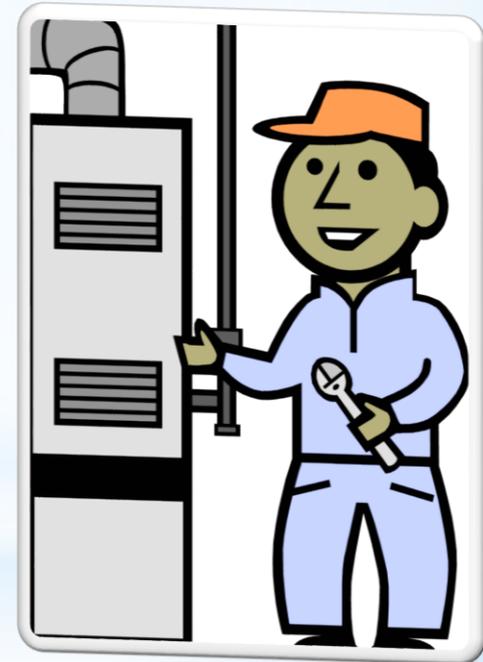


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Facility Inspections

**Make an appointment with the
Maintenance person. Make sure to
ask:**

- * Do any plumbing plans or construction drawings exist
- * If facility has own ccc program, contact program administrator or manager.
- * Check for maintenance records.

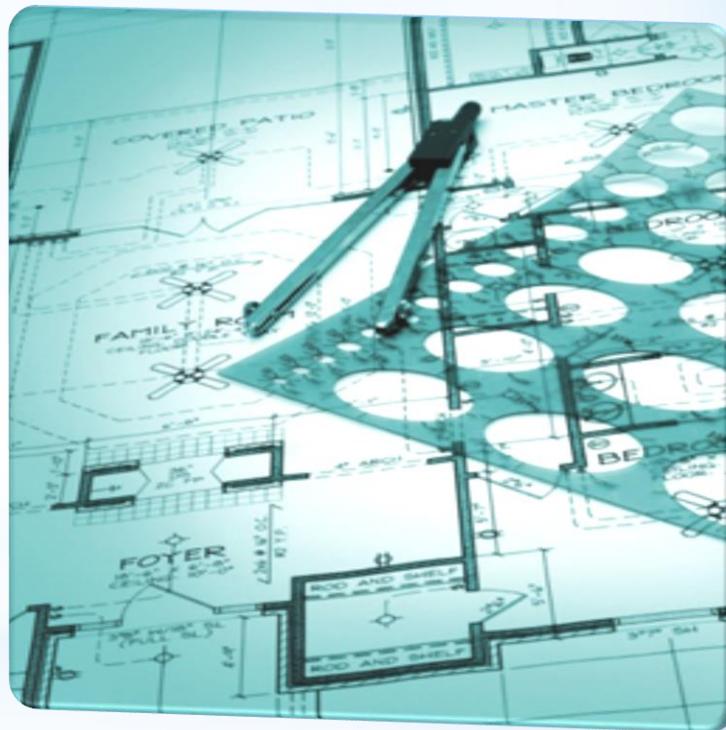


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Facility Inspections

Review building drawings if available

- * Does your system do plan reviews of new construction via building permits?
- * Determine preliminary protection requirements.
- * What is planned for the facility.
- * Encourage builder to plan for worse case scenarios.



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Facility Inspections

YOU NEVER KNOW WHAT YOU WILL COME ACROSS

Could be Simple



May be Complex



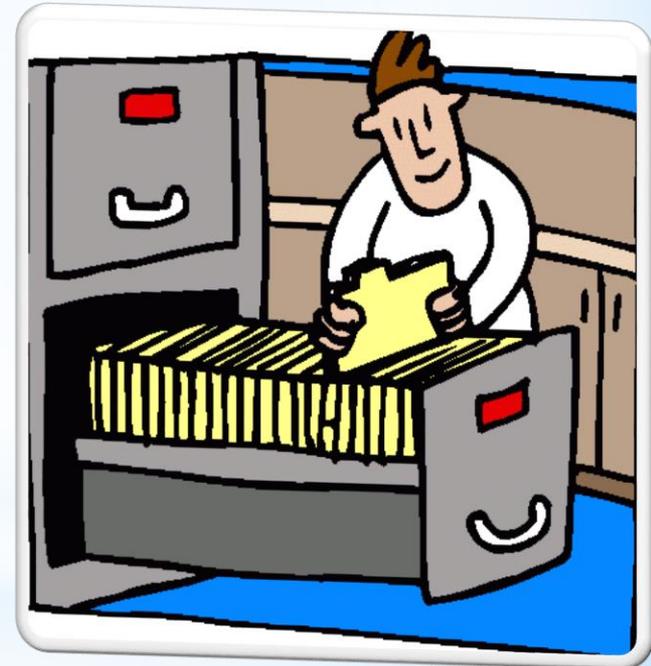
Follow the Flow!

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Documentation

Proper documentation and record maintenance is crucial.

- * Assemble all of the pertinent documentation from the survey.
- * Enter information and attach photos to database.
- * Make sure you keep accurate records.
- * Recommend both electronic and hardcopy.

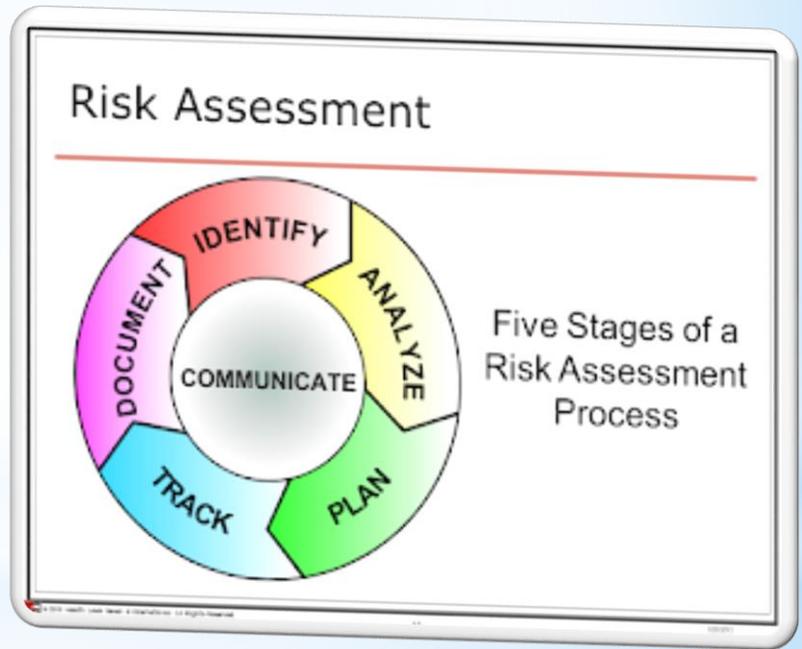


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Risk Assessment

Utilize information gathered from the site survey to determine the level of risk.

- * Do you know the current or anticipated use of the facility?
- * Use industry standard criteria to determine overall risk of the facility and type of protection needed.





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Appropriate Protection

Selection of the appropriate level of protection is your responsibility.

- * Use risk assessment to determine required level of protection per your standards.
- * Verify that the required protection is commensurate with the highest degree of hazard associated with the facility.

Five Means of Preventing Backflow

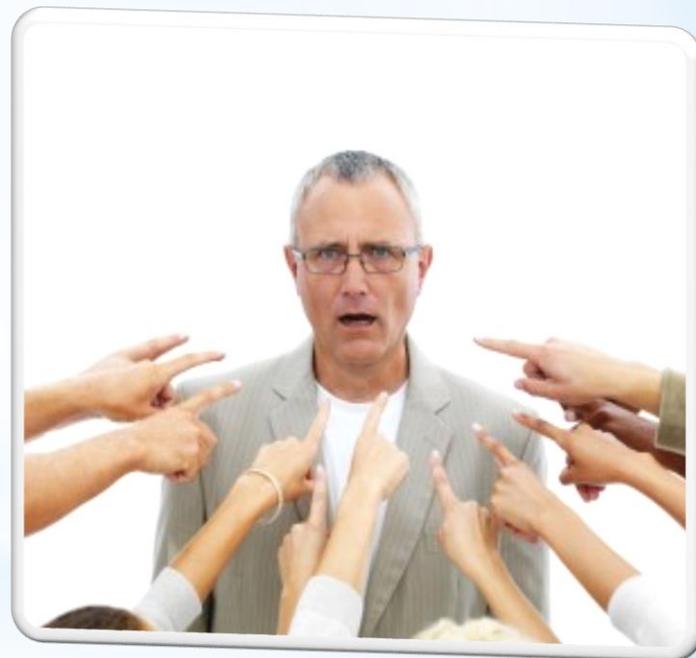
- Air Gap Separation
- Reduced Pressure Principle Assembly
- Double Check Valve Assembly
- Pressure Vacuum Breaker/
Spill-Resistant Vacuum Breaker
- Atmospheric Vacuum Breaker

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Notification of Owner

**Notify the facility owner
your findings and any
required backflow
protection.**

- * Notify them as to whether current protection is adequate or upgrades will be required.
- * If new or increased level of protection is required, mutually agree on timeline for implementation



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Annual Report

Make sure to file any required annual reports.

- * Washington and Oregon require annual reports to be filed with the respective department.
- * Reports can now be done online and submitted electronically.
- * Idaho has no annual reporting requirement.





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Incident Response

**If an incident occurs,
investigate and report it.**

- * If an incident is reported and your follow up investigation confirms, report it to your respective regulatory agency.
- * Keep a record of the incident for your own uses in case it ever occurs again.



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* *Questions?*

