Guidance Document:

Cross-Connection Control for Small Water Systems—No Appendix

March 2004
Revised

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

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Contents

4.0 Cross-Connection Control Regulations for Public Water Systems in Washington State

5.0 Reasons for Cross-Connection Control Programs

6.0 Starting a Program

7.0 Implementing a Cross-Connection Control Program

Foreword

The purpose of this manual is to provide guidance on the development and implementation of a cross-connection control (CCC) program that will comply with the drinking water regulations, Chapter 246-290-490 Washington Administrative Code. This manual was prepared for Group A public water systems with less than 1,000 connections.

Although the elements of a CCC program for small, medium, and large water systems are essentially the same, a small water system program may often be streamlined to:

- Suit the lower health risk posed by a predominantly residential customer base; and
- Reduce the purveyor's program administration, and thus, operating costs.

This manual is divided into the following general areas:

- Chapters 1 through 5 provide an overview of cross-connection control;
- Chapter 6 outlines the decisions to be made when starting a CCC program;
- Chapter 7 addresses day-to-day program operation;
- Chapter 8 contains the CCC regulations and related reference materials; and
- The appendices provide reference materials, including sample written program plans.

This manual may be viewed and downloaded from Washington State Department of Health Office of Drinking Water website: http://www.doh.wa.gov/ehp/dw

For purveyors without Internet access, a CD of the manual is available upon request from the Office of Drinking Water.

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A special thanks is extended to the Spokane Region Cross-Connection Control Committee (SRC4) for permission to use the diagrams shown as Illustrations 1 and 2.

Chapter 1. Purpose

The purpose of this guidance manual is to:

- Explain the need for a cross-connection control (CCC) program;
- Summarize Washington State Department of Health (DOH) regulatory requirements for developing and implementing a CCC program;
- Outline the options available for complying with CCC regulations; and
- Provide information to assist purveyors with the day-to-day implementation of a CCC program.

This manual is designed to provide guidance and resource information on cross-connection control to DOH-certified cross-connection control specialists, CCC program managers, public water system managers, water system governing bodies, public water system legal counsel, and Local Administrative Authorities (building/plumbing officials). The manual was developed for Group A public water systems with less than 1,000 connections.

For small water systems that contract with a DOH-certified cross-connection control specialist (CCS) for development of a program, this manual can be used as a resource to help ensure that the contractor's program includes all the elements discussed in Chapters 6 and 7.

Throughout this manual, the terms *must*, *shall*, and *required* are used to indicate a Washington State regulatory requirement. The terms *should* or *recommend* are used to indicate recommended procedures, schedules, and/or criteria.

Chapter 2. Introduction

2.1 Overview of Cross-Connection Control

A ***cross connection*** is defined as any actual or potential physical connection between a public water system or the consumer's water system and any source of non-potable liquid, solid, or gas that could contaminate the potable water supply by backflow. Cross connections exist in all plumbing systems. Cross connections may also exist in the purveyor's water system facilities.

There are numerous well-documented cases where drinking water has been contaminated via unprotected cross connections. These cases have caused illness, injury, and in some cases, death, to consumers served by the system.

The task of eliminating all cross connections is enormous. However, all purveyors can implement CCC programs that reasonably reduce the risk of contamination to their systems. For a drinking water (potable water) supply to become contaminated via a cross connection, three things need to happen ***simultaneously***:

1. The potable water supply piping must be unprotected (or improperly protected) from a cross connection;

2. A physical cross connection must be made between the potable water supply piping and a contaminant source; and

3. Backflow conditions must occur.

Backflow is the flow of water (or other solid, liquid, or gas from any source) back into the potable water supply. Backflow may be due to either:

- Backsiphonage; or

- Backpressure.

2.2 Causes of Backflow: Backsiphonage

Backsiphonage is backflow caused by a negative pressure (vacuum or partial vacuum) in the supply piping. Backsiphonage occurs when system pressure is reduced below atmospheric pressure. The effect is similar to sipping water through a straw.

The following scenario illustrates how backsiphonage backflow conditions could occur in a public water system:

- A public water system main is shut off to repair a leak. The water main is at the base of a hill.

- The water main is at a lower elevation than the homes on the hill. This creates a situation where water in the plumbing in the homes on the hill can drain into the public water system main.

- When a customer at the bottom of the hill uses water, a siphon is created at households at the top of the hill and water drains out of their plumbing systems.

- At one household at the top of the hill, a garden hose is being used to fill a child's wading pool. The hose is submerged in the pool. See Illustration 1.

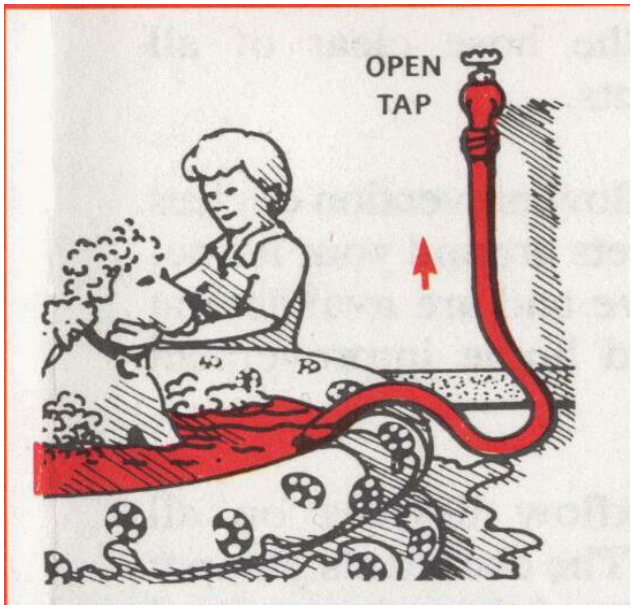
- When the backflow conditions occur, the non-potable water from the wading pool is siphoned through the cross connection (submerged hose) into the household plumbing and then into the water main.

- The water from the wading pool contaminates the water main.

- When water service is restored, contaminated water is delivered to customers served by the public water system.

See Illustration 1.

Illustration 1
Backsiphonage Backflow Hazard



2.3 Causes of Backflow: Backpressure

Backpressure is backflow caused by pressure in the customer's plumbing being greater than the pressure in the water supply piping. The higher pressure in the customer's plumbing may be from a booster pump, heating boiler, etc.

The following scenario illustrates how ***backpressure backflow*** could occur in a water system:

1. The fire department withdraws water from a hydrant. This reduces the pressure in the public water system main from 50 pounds per square inch (psi) to 20 psi.

2. A customer served by the public water system installed a lawn irrigation system. The customer's irrigation system is supplied with water from a pond. The pump supplying the irrigation system operates at 30 psi. To ensure a supply for the irrigation system when the pond is dry, the customer installed a standby connection to the household plumbing (potable water piping).

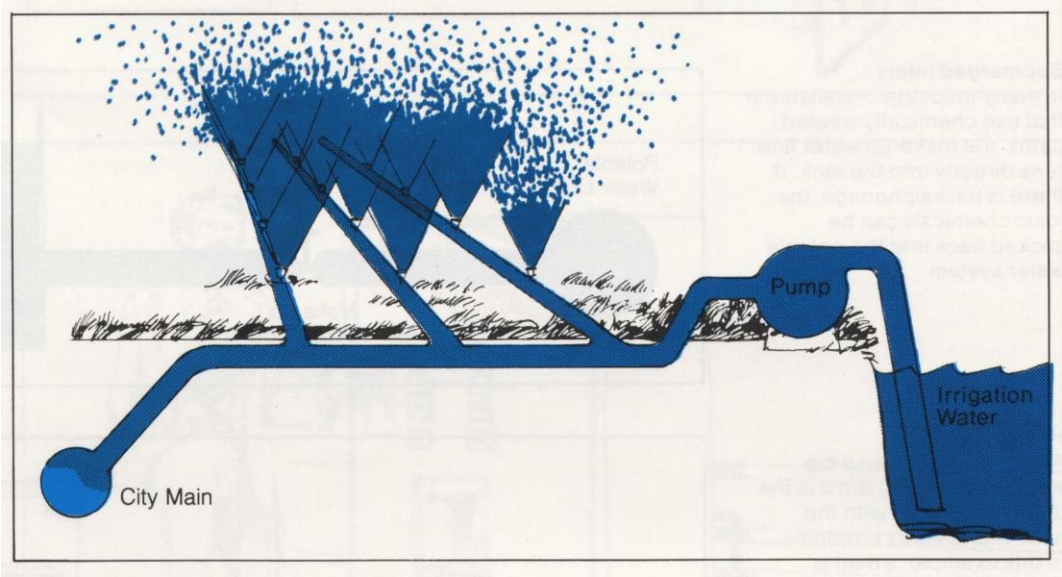
3. On the day of the fire flow situation, the normally closed valve between the household plumbing and irrigation piping is accidentally left open.

4. Backflow wouldn't normally occur at this customer's connection, because the pressure in the public water system is greater than the pressure supplied by the irrigation pump. However, during the fire flow situation, the pressure from the irrigation pump is greater than the pressure in the water main. Water from the pond is pumped into the household plumbing, and then into the public water system main. See Illustration 2.

5. When the fire flow ends, pressure in the public water system water main increases, and contaminated water is delivered to customers served by the system.

See Illustration 2.

Illustration 2
Backpressure Backflow Hazard



2.4 Methods of Backflow Prevention

Backflow can be prevented in two ways, either through installation of:

1. An approved air gap (AG) that provides a physical separation between the contaminant and the drinking water supply; or

2. Mechanical devices or assemblies that prevent backflow from occurring.

Air gaps (AGs) are commonly used to prevent backflow in household plumbing systems. Examples of AGs can be found in typical household kitchens and bathrooms. The physical separation between the kitchen faucet and kitchen sink rim is an approved AG. Similarly, the physical separations between the bathroom faucets and rims of the sinks and bathtubs are approved AGs. Current plumbing codes require all sinks and bathtubs sold in the United States to have "built in" approved AGs (designed for above the rim faucets) to prevent contamination of the household plumbing.

In addition to AGs, there are several methods of preventing backflow by mechanical means. These range from simple single check valves to elaborate approved backflow prevention assemblies. All mechanical devices and assemblies will prevent backflow to some degree when properly installed and maintained. ***However, not all mechanical devices and assemblies are created equal. Thus, not all mechanical devices and assemblies provide equivalent backflow protection.***

In fact, backflow preventers can be differentiated by a number of characteristics:

1. Backflow application conditions;
2. Degree of hazard;
3. Design;
4. Approval requirements; and
5. Use for premises isolation.

These characteristics are important to consider when deciding which type of backflow preventer to use to protect the public water system from contamination. The discussion below provides further detail.

Regarding ***backflow application conditions***, some devices and assemblies are designed to prevent backsiphonage backflow only. These are not effective in preventing backflow under backpressure conditions. Others are designed to prevent both backsiphonage and backpressure backflow. When selecting a backflow preventer to protect the public water system, the purveyor must make sure that the preventer is suitable for the backflow application conditions likely to occur for a particular connection (or fixture).

Backflow preventers must also be commensurate with the ***degree of health hazard*** (high vs. low) posed by the customer's plumbing system (or fixture) to the public water system. For example, some backflow preventers (i.e., assemblies) are manufactured to a very high standard, and thus, are more reliable in preventing backflow than devices manufactured to a lower standard. The more reliable assemblies must be used to prevent backflow in high hazard cross-connection situations.

Regarding ***backflow preventer design***, an important difference between various types of backflow preventers is whether the design allows them to be tested and repaired while in-line. The purpose of the testing is to determine whether they are properly functioning to prevent backflow. Preventers that are not testable are called ***devices,*** whereas ***assemblies*** are preventers designed for in-line testing and repair. Assemblies include isolating valves and test cocks.

Regarding ***approval status***, in Washington, backflow preventers that protect public water systems from contamination via cross connections must appear on the *Backflow Prevention Assemblies Approved for Installation in Washington* published by DOH. Yet, not all backflow preventers appear on the approved list. The list identifies only those assemblies that have successfully completed rigorous laboratory and field tests conducted by the University of Southern California's Foundation for Cross-Connection Control and Hydraulic Research. It is important for purveyors to ensure that all assemblies relied upon to protect the public water system appear on the above named list.

The last difference between the various types of backflow preventers is whether they can be used to *isolate* the customer's plumbing from the public water system distribution system. This concept is called ***premises isolation***. Premises isolation assemblies are usually located at the meter or property line. Some assemblies can be used for premises isolation, whereas others are used to prevent backflow at fixtures only. The concept of installing a backflow preventer at a particular fixture, such as a boiler, is called ***fixture protection***. When selecting a backflow preventer for a specific situation, it is important to consider whether the preventer is to be used for premises isolation or fixture protection. Note: Washington Administrative Code (WAC) 246-290-490(4) mandates premises isolation for high hazard premises.

The following list identifies mechanical backflow preventers available on the market and their respective acronyms. The list identifies non-testable *devices* first and then identifies testable *assemblies*.

1. Devices

    a. Residential Meter Check / Single-Check Valve (CV)

    b. Dual-Check Backflow Preventer (DCV)

    c. Dual-Check with Atmospheric Vent (DCAV)

    d. Hose Bibb Vacuum Breaker (HBVB)

    e. Atmospheric Vacuum Breaker (AVB)

2. Assemblies

    a. Spill-Resistant Vacuum Breaker Assembly (SVBA)

    b. Pressure Vacuum Breaker Assembly (PVBA)

    c. Double-Check Valve Assembly (DCVA)

    d. Double-Check Detector Assembly (DCDA)

    e. Reduced-Pressure Backflow Assembly (RPBA)

    f. Reduced-Pressure Detector Assembly (RPDA)

Note: The term "detector" in the above assemblies list refers to a small water meter installed in a by-pass arrangement for detection of water use. These are most often used for fire sprinkler installations.

For protection of a public water system from contamination, DOH recognizes as acceptable methods of backflow prevention *approved*:

1. Air gaps (AG);
2. Reduced-pressure backflow assemblies (RPBA);
3. Reduced-pressure detector assemblies (RPDA);
4. Double-check valve assemblies (DCVA);
5. Double-check detector assemblies (DCDA);
6. Pressure vacuum breaker assemblies (PVBA);
7. Spill-resistant vacuum breaker assemblies (SVBA); and
8. Atmospheric vacuum breakers (AVB).

As mentioned previously, WAC 246-290-490 (4) requires premises isolation for high-hazard premises. These premises must be isolated from the public water system by an approved AG or RPBA. Other assemblies, such as DCVAs, may be used for premises isolation for lower hazard situations. Table 1 shows which backflow preventers are suitable for various combinations of backflow application conditions and health hazards that purveyors may encounter.

For premises that are not considered high hazard, the purveyor may rely on assemblies and/or devices installed within the customer's plumbing system to protect the public water system. Note: The latter is allowed, because the backflow assemblies and/or devices installed within the customer's plumbing system reduce the health risk to a level where an approved assembly is not required at the meter to protect the public water system. Devices may be used where an approved assembly is not required.

Table 1
General Installation Guide
for Premises Isolation

Approved Backflow Preventer Type	Degree of Health Hazard		Backflow Conditions	
	High	*Low*	*Backsiphonage*	*Backpressure*
AG	Yes*	Yes	Yes	Yes
RPBA/RPDA	Yes	Yes	Yes	Yes
DCVA/DCDA	No	Yes	Yes	Yes

* "Yes" denotes that the specific type of preventer is suitable for the health hazard and backflow conditions ("No" indicates that the preventer type is not suitable for the conditions noted).

Chapter 3. State and Federal Regulations and Jurisdictions

3.1 Overview of Federal and State Drinking Water Regulations

The Safe Drinking Water Act (SDWA) passed by Congress in 1974 authorized the development of national regulations to ensure safe drinking water for consumers served by public water systems. **The 1974 Safe Drinking Water Act and subsequent amendments (through 2002) do not specifically address the topic of cross-connection control.** However, the U.S. Environmental Protection Agency is currently considering development of federal CCC rules. Thus, federal CCC rules may be promulgated sometime in the future.

Current federal drinking water rules do not specifically require the purveyor to have a cross-connection control program.

Confusion about cross-connection control has arisen, due to the belief by some purveyors that, under the SDWA, the "purveyor is responsible for water quality to the last free-flowing tap." This confusion may have resulted from some federal rules that require purveyors to monitor certain water quality parameters (i.e., lead and copper levels) in samples collected at the customer's tap.

However, under the SDWA, purveyors are only responsible for the water quality delivered to customers at the meter. The purveyor is ***not*** responsible for contaminants added to the water by circumstances under the control of the customer (i.e., beyond the meter).

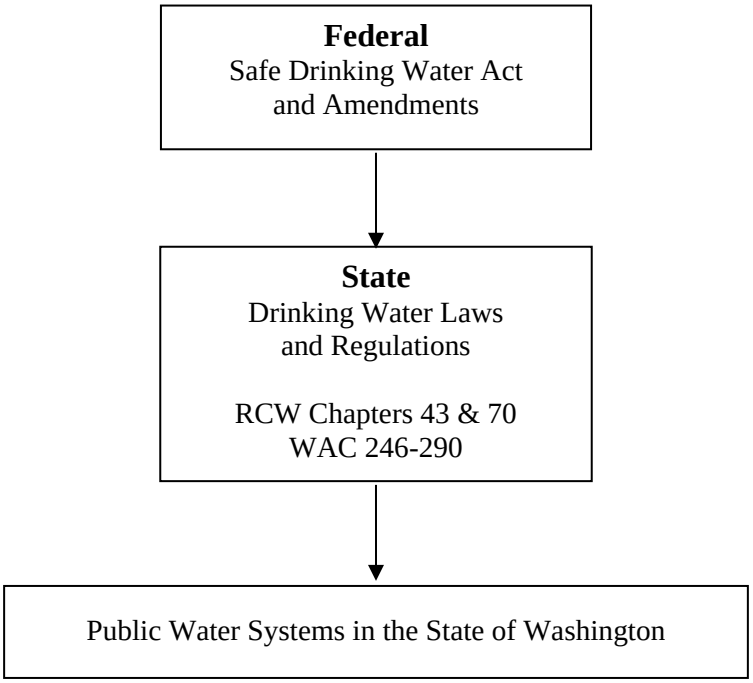
Under federal rules, the purveyor is only responsible for the water quality delivered to the customer's meter.

Under the SDWA, the federal government may grant state governments "primacy" for the administration and enforcement of the federal drinking water regulations. States with primacy must adopt drinking water regulations that are at least as stringent as the federal drinking water rules. **Washington *is* a primacy state.**

Besides adopting the federal drinking water rules, primacy states may adopt additional (or more stringent) drinking water regulations as long as they are not in conflict with the SDWA and/or federal rules. In Washington, CCC requirements are state-imposed. Similarly, lower levels of government (e.g., counties and cities) within the state, with the authority of the state, may impose additional (or more stringent) regulations as long as they are not in conflict with the state regulations.

Both federal and state governments regulate the public health aspects of drinking water "to protect the health, safety, or welfare of the users of water." These regulatory entities "govern the manufacturers and distributors of water" (e.g., water utilities, bottled water plants, etc.). Regulations apply to the entity that owns (controls) the facilities for the manufacture and/or distribution of water. The higher level of government (the State) regulates government entities (e.g., a city or water district) that own water utilities. Figure 1 illustrates the hierarchical relationship in the regulatory authority of the federal and state levels of government with respect to public water systems.

Figure 1
Regulation of Drinking Water



In Washington State, the laws (statutes) enacted by the legislature are published in the Revised Code of Washington (RCW). The RCWs establish general statutory authority. Subordinate to the RCWs, state agencies or boards, such as the State Board of Health adopt administrative rules through the Washington Administrative Code (WAC). The WACs provide details consistent with the RCWs. In addition to administrative rules, state agencies may issue guidance documents and/or other reference materials on how to comply with the RCWs and WACs. RCWs and WACs are enforceable by the State, whereas guidelines are not enforceable.

Chapter 43 of the Revised Code of Washington assigns to DOH the responsibility to "Review and approve plans for **public water system** design, engineering, operation maintenance, financing, and emergency response, as required under State Board of Health rules." The RCW defines a ***public water system*** as "any system, excluding a system serving only one single-family residence and a system with four or fewer connections all of which serve residences on the same farm, providing piped water for human consumption, including any **collection, treatment, storage, or distribution facilities *under control of the purveyor*** and used primarily in connection with the system." This definition is consistent with the federal SDWA definition of a public water system.

The definition of public water system goes to the heart of the regulatory authority of DOH and the purveyors it regulates. For most purveyors, ***control*** ends at the water meter to the customer's premises. The meter would be located within a public street right-of-way or within a utility easement. Public water systems where the owner controls (owns) the collection through distribution facilities *and* the plumbing system would be considered exceptions. These could include both non-transient (e.g., schools) and transient (e.g., gambling casino) non-community systems as well as some community systems.

WAC 246-290 (Group A Drinking Water Regulations) applies only to the purveyor and not to the purveyor's customers.

3.2 Jurisdictions of Washington State Department of Health and Other State Agencies Relating to Cross-Connection Control

The state legislature may assign the administration and enforcement of statutes and regulations to different departments (agencies) within state government. In Washington, several state departments have responsibilities for the administration and/or enforcement of CCC-related regulations.

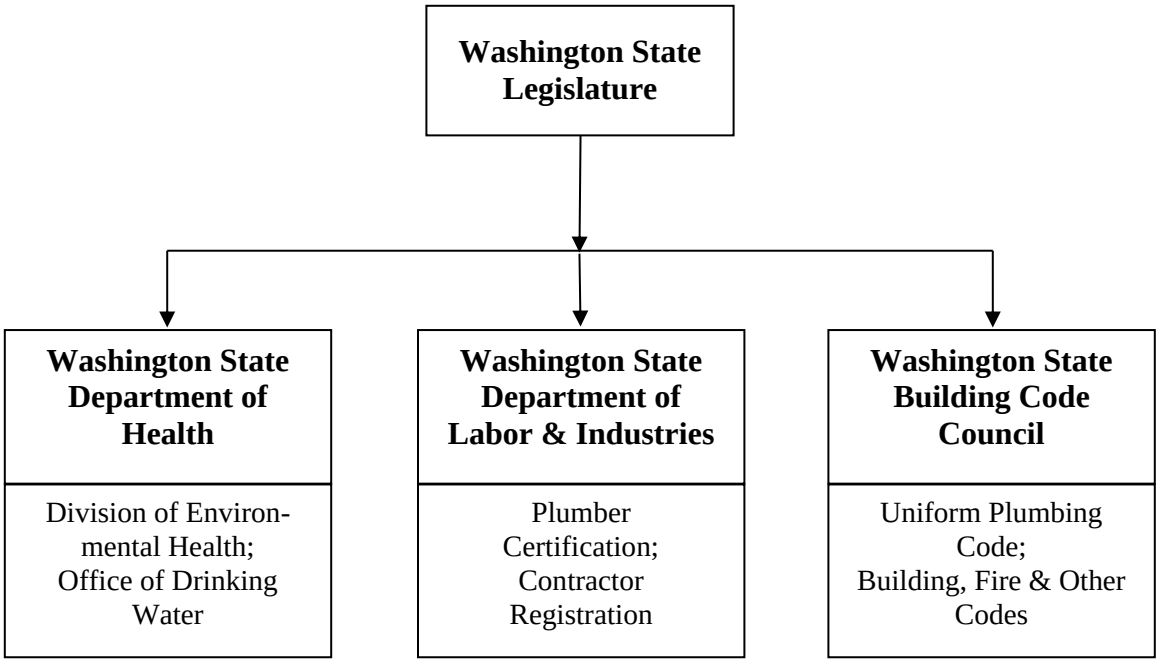
These agencies include, but are not necessarily limited to:

- Washington State Department of Health (DOH);

- Washington State Building Code Council (SBBC);
- Washington State Department of Labor and Industries (L&I);
- Washington State Department of Agriculture; and
- Washington State Department of Ecology.

The following discussion provides basic information about the respective jurisdictions of DOH, the SBCC, and L&I. In addition to DOH, the SBCC and L&I have the most potential to impact purveyors. Figure 2 identifies these agencies and their respective cross-connection related program responsibilities.

Figure 2
Principal Jurisdictions Relating to the
Purveyor's Cross-Connection Control Program



3.2.1 Washington State Department of Health Regulates Cross-Connection Control for Public Water Systems

As mentioned above, DOH is one of several agencies with regulations pertaining to cross-connection control. DOH Office of Drinking Water administers and enforces drinking water regulations for public water systems as set forth in Chapter 246-290 WAC. The mission of the Office of Drinking Water is to protect the health of the people of Washington State by ensuring safe and reliable drinking water.

The requirement for public water systems to develop and implement CCC programs as set forth in WAC 246-290-490 is consistent with the mission of the Office of Drinking Water. Except for certain types of public water systems where the consumption of water is solely within the property owned by the purveyor, the jurisdiction of WAC 246-290-490 ends at the purveyor's water meter.

3.2.2 Other State Agencies with Plumbing-Related Cross-Connection Control Responsibilities

The primary regulation of plumbing and plumber certification falls under the jurisdiction of two different agencies. These agencies are the:

- Washington State Building Code Council (SBCC); and
- Washington State Department of Labor and Industries (L&I).

The SBCC adopts the Uniform Plumbing Code (UPC) with state amendments specific to Washington (under RCW 19.27). The UPC applies within the property lines of the customer's premises. Labor and Industries enforces plumber certification requirements (under RCW 18.106). The plumber certification requirements apply within buildings only. Information on the full text of these statutes is available through the following website: http://www.access.wa.gov/

Further information about the respective jurisdictions of these agencies is provided below.

WAC 246-290 applies to the collection, treatment, storage and distribution facilities *under the purveyor's control*.

RCW 19.27 (Uniform Plumbing Code) applies *within the property lines of the customer's premises*.

RCW 18.106 (requirement for certified plumbers) applies *within* buildings only.

Washington State Building Code Council

Washington State Building Code Council (SBCC) establishes the minimum requirements for the design and installation of plumbing in Washington through adoption of the Uniform Plumbing Code (often referred to as the UPC). The UPC is applicable statewide. As mentioned above, the UPC applies ***within the property lines of the customer's premises***. The UPC in effect in Washington includes amendments specific to Washington. These include a number of CCC amendments.

The various departments of state government are not supposed to adopt contradictory regulations, including regulations on cross-connection control. Thus, during the most recent major revision process of the CCC regulations for Group A public water systems, DOH worked closely with the SBCC to ensure greater consistency between WAC 246-290-490 and the UPC (as amended for Washington). To ensure this consistency, DOH has continued to work closely with the SBCC on subsequent revisions to the UPC.

In fact, starting with the 1997 Uniform Plumbing Code, the SBCC has adopted a number of CCC amendments to maintain or enhance consistency with WAC 246-290-490. Information on Washington State's amendments to the UPC can be found on the SBCC website. Their web address is: http://www.sbcc.wa.gov/

Although the SBCC is responsible for adoption of the UPC, Local Administrative Authorities (i.e., local building and/or plumbing officials) administer and enforce the UPC. Customers (i.e., owners of potable water plumbing) must comply with the UPC in effect at the time of installation, whether or not the Local Administrative Authority inspects the plumbing.

Note: RCW 19.27 does not provide authority for purveyors to regulate plumbing. In fact, most purveyors have no authority, and thus, no responsibility, beyond the meter for the customer's compliance with the UPC. The only exception to this would be systems where the purveyor owns the water supply through distribution facilities *and* the plumbing.

Washington State Department of Labor and Industries

Washington State Department of Labor and Industries (L&I) requires persons engaged in the craft of plumbing to be certified. The craft of plumbing includes installing, repairing and replacing plumbing and applies *within buildings only*. Some plumbing activities require a journeyman's plumber certificate, whereas other plumbing activities, such as backflow assembly repair, require only a specialty plumber certificate.

The plumber certification requirements may impact some DOH-certified Backflow Assembly Testers (BATs) working in a purveyor's service area. WAC 246-290-490 and the UPC (WAC 51-0603.3) both require DOH-certified BATs to conduct backflow prevention assembly (BPA) testing. RCW 18.106 requires certified journeyman plumbers to install backflow prevention assemblies within buildings.

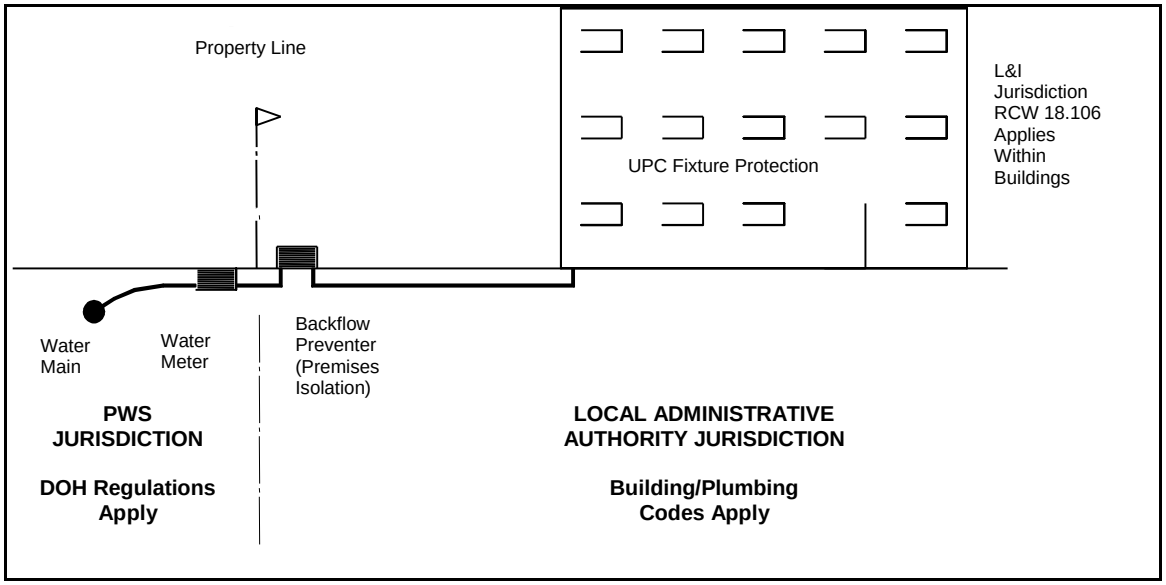
In 2001, RCW 18.106 was amended and a new specialty plumber certification for backflow assembly maintenance and repair was created. Effective January 1, 2003, BATs that repair backflow prevention assemblies within buildings must hold a valid specialty plumber certificate issued by L&I. Further information on the plumbing certification laws and regulations can be obtained by accessing the following website:
http://www.lni.wa.gov/scs/plumbing/

Summary

In summary, a DOH-certified BAT must test any assembly that the purveyor relies upon to protect the public water system. However, only a journeyman plumber or a DOH-certified tester holding a current specialty plumbing certification may repair the assembly if it is located within a building.

Purveyors may wish to recommend that any customer with one or more in-premises assemblies hire a DOH-certified BAT that also holds a specialty plumbing certificate (in case the customer's assembly needs to be repaired). Illustration 3 shows, for a typical community water system, the respective jurisdictions of the water purveyor, Local Administrative Authority and L&I.

Illustration 3
Public Water System/Local Administrative Authority Jurisdictions



3.3 History of Cross-Connection Control Regulations in Washington

Chapter 246-290 WAC is the primary document currently used by DOH to administer the RCWs that address public water systems and the protection of drinking water. Since 1970, public water systems in Washington have been required to develop CCC programs to protect their systems from contamination. In fact, the 1978 cross-connection regulations (WAC 248-54-820) included essentially all the program requirements of the current WAC 246-290-490. Specifically, WAC 248-54-820 included the following statement:

> "A continuing and aggressive program of cross-connection investigation, surveillance and control shall be implemented according to good CCC practice such as *Accepted Procedure and Practice in Cross-Connection Control Manual - Pacific Northwest Section - American Waterworks Association, Second Edition*."

The current WAC 246-290-490 differs from previous regulations by:

- Clarifying the jurisdiction of the water purveyor versus Local Administrative Authority (e.g., local building and plumbing officials) with regards to cross-connection control;

- Listing and providing details on the minimum elements of a CCC program, rather than merely referencing the CCC manual published by the Pacific Northwest Section of the American Water Works Association (PNWS-AWWA); and

- Identifying specific categories of high hazard premises for which premises isolation is mandated.

Details on the current CCC regulations are provided in Chapter 4. A copy of WAC 246-290-490 is provided in Chapter 8.

Chapter 4. Cross-Connection Control Regulations for Public Water Systems in Washington State

This chapter contains detailed information about the CCC requirements set forth in WAC 246-290-490. A copy of the WAC (including CCC-related definitions from WAC 246-290-010) is included in Chapter 8.

4.1 Applicability

All Group A community and non-community public water systems must comply with the CCC requirements of WAC 246-290-490.

4.2 Overview of Regulations

WAC 246-290-490 requires purveyors to develop *and* implement CCC programs to protect their systems from contamination via cross connections. The specific purpose of a CCC program is to protect public health by helping to ensure the quality of water delivered to customers. This is accomplished by protecting the collection, treatment, storage and distribution facilities *under the control of the purveyor* from contamination via cross connections.

Regarding program development, WAC 246-290-490 requires purveyors to include a written description of the CCC program in the purveyor's *Water System Plan* (required in WAC 246-290-100) or *Small Water System Management Program* (required in WAC 246-290-105). If you are unsure whether your system must develop a *Water System Plan* or *Small Water System Management Program*, consult WAC 246-290-100 and 246-290-105 respectively and/or your DOH regional engineer.

In addition to the written program plan, the regulations specifically require purveyors to ***implement*** their CCC programs. ***This is because implementation is the key to protecting the health of consumers served by the water system***. Implementation activities include, but are not limited to:

- Hazard surveys;
- Installation of backflow preventers to protect the public water system;
- Establishing a record-keeping system;
- Tracking assembly test reports; and
- Public education.

Note: No public health protection is obtained when a system develops but fails to implement its cross-connection control program! The WAC gives purveyors the option to implement their cross-connection programs, or any part, directly or by means of a contract with another agency or party acceptable to DOH.

Regarding program development and implementation, the general CCC program requirements established by WAC 246-290-490:

1. Require purveyors to use good engineering and public health protection practices.

2. Give purveyors the option to use as guidance the most recently published editions of the following publications (in addition to DOH publications):

    a. *Manual of Cross-Connection Control*, published by the University of Southern California Foundation for Cross-Connection Control and Hydraulic Research; and

    b. *Cross-Connection Control Manual, Accepted Procedure and Practice*, published by the Pacific Northwest Section, American Water Works Association.

3. Give purveyors the option to establish CCC program requirements that are more stringent than the requirements specified in the WAC.

Under WAC 246-290-490, purveyors must ensure that cross connections between the distribution system and a consumer's water system are eliminated or controlled. In most cases, eliminating cross connections is almost impossible. Thus, ***control*** of cross connections is the more common approach used to protect public water systems from contamination. Under the WAC, control of cross connections must be accomplished by the installation of approved backflow preventers commensurate with the degree of hazard.

The WAC offers purveyors flexibility in CCC program implementation. Under the WAC, purveyors have the option to implement two different types of programs. Purveyors must implement either:

1. ***Premises Isolation Program***, where all backflow prevention assemblies that protect the public water system are located at the customer's meter to isolate the customer's plumbing system from the public water system distribution system; or

2. ***Combination program***, where premises isolation backflow preventers are installed for high hazard facilities, and for other types of facilities, backflow preventers are installed for fixture protection (or area isolation) within the customer's premises.

Regardless of the type of program implemented, WAC 246-290-490 requires all purveyors to comply with the mandatory premises isolation requirements for high hazard facilities of the type listed on Table 9 of WAC 246-290-490. Thus, purveyors that implement combination programs must ensure that all high hazard facilities they serve are isolated from the public water system with an approved backflow preventer commensurate with the degree of hazard (RPBA or AG).

Where mandatory isolation is not required under the WAC, purveyors may rely on in-premises protection in lieu of premises isolation. Purveyors implementing combination programs often choose this option for non-high hazard premises with limited internal cross-connection hazards. This option is usually less costly for the customer, since the assemblies used for fixture protection are smaller than assemblies used for premises isolation.

In situations where the purveyor relies upon fixture protection to protect the public water system, the WAC requires purveyors to ensure that the level of protection provided by the in-premises assemblies is equivalent to the level of protection that would be provided by a premises isolation assembly. The WAC specifies a number of conditions that must be met to ensure the equivalent protection. In-premises backflow preventers relied upon by the purveyor to protect the public water system must:

- Be commensurate with the degree of hazard;
- Appear on the list of assemblies approved by DOH; and
- Be installed, inspected, tested, maintained, and repaired in accordance with the same requirements that premises isolation backflow preventers must meet.

In addition to the above conditions, the WAC requires purveyors to keep the same type of records on in-premises backflow preventers as for the premises isolation assemblies. Last of all, where the purveyor relies on in-premises preventers to protect the public water system, the purveyor must have access to the consumer's premises to conduct an initial hazard survey and periodic resurveys.

In summary, under WAC 246-290-490, purveyors are only required to maintain records on the assemblies that are relied upon to protect the public water system from contamination. Thus, for connections with premises isolation assemblies, the purveyor must maintain records on the premises isolation assembly only. For connections without premises isolation, the purveyor must maintain records on all in-premises assemblies that are relied upon to protect the public water system from contamination.

To protect their systems from contamination, purveyors must take "corrective action" when they become aware of unprotected cross connections and/or customers fail to comply with the purveyor's CCC requirements. Specifically WAC 246-290-490 requires purveyors to take appropriate corrective actions when:

1. Cross connection exists and is not controlled commensurate with the degree of hazard; and/or

2. Customer fails to comply with the purveyor's requirements for installation, inspection, testing, maintenance or repair of approved backflow preventers.

Under the WAC, purveyors have flexibility in what corrective action to take to protect their systems from contamination. Corrective actions may include, but are not limited to the purveyor:

1. Denying or discontinuing water service to the non-complying customer;

2. Requiring the customer to install an approved backflow preventer commensurate with the degree of hazard; or

3. Installing an approved backflow preventer for premises isolation.

WAC 246-290-490 requires purveyors to coordinate with the Local Administrative Authority (e.g., building or plumbing official) on CCC issues. Similarly, the Uniform Plumbing Code amended for Washington requires Local Administrative Authorities to coordinate with purveyors on CCC issues. Coordination can range from information sharing to implementation of joint programs. Under WAC 246-290-490, purveyors must document the level of coordination with the Local Administrative Authorities, including the delineation of CCC responsibilities, in the required written CCC program plan described above. Although recommended, written agreements with the Local Administrative Authority are not required under WAC 246-290-490. As part of the coordination efforts, the cross-connection regulations require purveyors to notify the Local Administrative Authority when denying or discontinuing water service to a customer.

Backflow results in the *unintended* return of ***used water***, i.e., water that has left the control of the purveyor, into the distribution system. However, some customers may have heating and/or cooling systems that are designed to *intentionally* return water to the purveyor's distribution system. The WAC requires purveyors to prohibit the intentional return of used water to their distribution systems. This is because used water has left the control of the purveyor, is of unknown quality (may contain contaminants) and may be at a significantly different temperature than the purveyor's water supply. Customers with these types of heating or cooling systems must dispose of the water in some other manner in lieu of returning it to the purveyor's distribution system.

4.3 Minimum Elements

To be acceptable to DOH, the purveyor's CCC program must include the minimum elements specified in WAC 246-290-490(3). There are 10 minimum program elements listed in the WAC. The requirements for each of the minimum elements are provided below. Guidance for implementing each of the minimum elements is provided in Chapter 7 of this manual.

Element 1: Establish Legal Authority

The purveyor must adopt a local ordinance, resolution, code, bylaw, or other written legal instrument that:

1. Establishes the purveyor's legal authority to implement a CCC program;

2. Describes the operating policies and technical provisions of the purveyor's CCC program; and

3. Describes the corrective actions used to ensure that consumers comply with the purveyor's CCC requirements.

Guidance for implementing each of these elements is provided in Chapter 7.

Element 2: Procedures/Schedules for Hazard Evaluations

The purveyor must develop and implement procedures and schedules for evaluating new and existing service connections to assess the degree of hazard posed by the consumer's premises to the purveyor's distribution system and notify the consumer within a reasonable time frame of the hazard evaluation results. At minimum, the program shall meet the following:

1. For ***new*** connections made on or after the effective date of the DOH CCC regulations (i.e., April, 1999), procedures shall ensure that an initial evaluation is conducted before service is provided;

2. For ***existing*** connections made prior to the effective date of the DOH CCC regulations (April, 1999), procedures shall ensure that an initial evaluation is conducted in accordance with a schedule acceptable to DOH; and

3. For ***all*** service connections, once an initial evaluation has been conducted, procedures shall ensure that periodic re-evaluations are conducted in accordance with a schedule acceptable to DOH and whenever there is a change in the use of the premises.

Element 3: Procedures/Schedules to Eliminate/Control Cross Connections

The purveyor must develop and implement procedures and schedules to ensure that:

1. Cross connections are eliminated whenever possible;

2. Cross connections are controlled by installation of approved backflow preventers commensurate with the degree of hazard (when the cross connections can't be eliminated); and

3. Approved backflow preventers are installed in accordance with the requirements of WAC 246-290-490(6).

Element 4: Provide Qualified Personnel

The purveyor must ensure that personnel, including at least one person certified as a CCS, are provided to develop and implement the CCC program.

Element 5: Procedures/Schedules for Backflow Preventer Inspection and Testing

The purveyor must develop and implement procedures to ensure that approved backflow preventers are inspected and/or tested (as applicable) in accordance with WAC 246-290-490(7).

Element 6: Assembly Testing Quality Assurance/Quality Control (QA/QC)

The purveyor must develop and implement a BPA testing quality assurance/quality control program including, but not limited to, documentation of tester certification and test kit calibration, test report contents, and time frames for submitting completed test reports.

Element 7: Backflow Incident Response Plan

The purveyor must develop and implement (when appropriate) procedures for responding to backflow incidents.

Element 8: Public Education

Purveyors must include information on cross-connection control in their existing programs for educating consumers about water system operations. Such programs may include periodic bill inserts, public service announcements, pamphlet distribution, notification of new consumers and consumer confidence reports.

Element 9: Establish/Maintain Cross-Connection Control Records

The purveyor must develop and maintain CCC records including, but not limited to, the following:

1. A master list of service connections and/or consumer's premises where the purveyor relies upon approved backflow preventers to protect the public water system from contamination, the assessed hazard level of each connection, and the required backflow preventer(s);

2. Inventory information on:

    a. Approved AGs installed in lieu of approved assemblies including exact AG location, assessed degree of hazard, installation date, history of inspections, inspection results, and person conducting inspections:

    b. Approved backflow assemblies including exact assembly location, assembly description (type, manufacturer, model, size, and serial number), assessed degree of hazard, installation date, history of inspections, tests and repairs, test results, and person performing tests; and

    c. Approved AVBs used for irrigation system applications including location, description (manufacturer, model, and size), installation date, history of inspection(s), and person performing inspection(s).

3. Cross-connection program annual summary reports and backflow incident reports required under WAC 246-290-490(8).

Element 10: Meet Additional Reclaimed Water Requirements

Purveyors who distribute and/or have facilities that receive reclaimed water within their water service areas must meet any additional CCC requirements imposed by DOH under a permit issued in accordance with Chapter 90.46 RCW.

Examples of written programs containing the above elements are included in Appendices A and B.

Chapter 5. Reasons for Cross-Connection Control Programs

5.1 Health Aspects

The first and foremost reason for developing and implementing a CCC program is to protect the health of consumers served by the public water system. This is accomplished by preventing contamination of the public water system via cross connections.

The purveyor of a public water system has the responsibility to deliver water to its consumers that meets all health standards in the Safe Drinking Water Act and the Washington State Drinking Water Regulations for Group A systems (Chapter 246-290 WAC). The water should also be desirable from an aesthetic standpoint to reduce the likelihood of consumers turning to an unapproved water supply.

Both the drinking water regulations (Chapter 246-290 WAC) and the DOH Water System Design Standards contain many requirements that help ensure a safe water supply for consumers served by public water systems. These requirements include:

- Source protection requirements (watershed control, wellhead protection);
- Treatment design and performance standards (filtration, chlorination);
- Distribution system design and construction (covered reservoirs, pressure standards); and
- Proper operations (certified personnel, water quality monitoring, cross-connection control).

The greatest health risk to consumers served by public water systems lies in the introduction of a contaminant into the public water system. By design, the water distribution system is an efficient means of transporting drinking water to consumers served by the system. However, the distribution system can also become the conduit for the spread of a contaminant to a large population.

Once introduced into the distribution system, a contaminant can move as a "slug." This type of situation may result in extremely high concentrations in the drinking water. In other situations, the contaminant may become diluted quickly. If this occurs, lower concentrations of the contaminant will be present in the drinking water. Without extensive knowledge of flows in a distribution system, such as those provided by a hydraulic modeling program, purveyors will have a difficult time predicting what will happen once a contaminant enters the water distribution system.

There are three categories of contaminants of importance to purveyors from a CCC standpoint. These are:

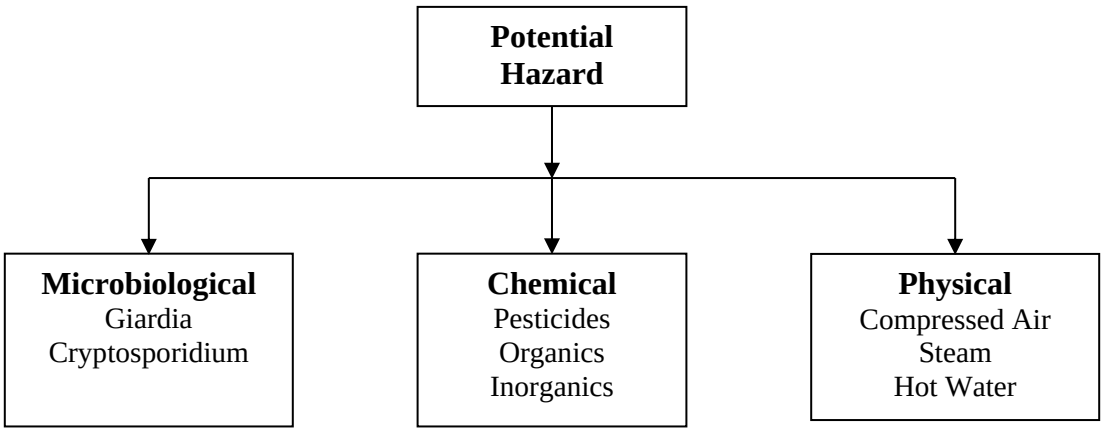
1. Microbiological contaminants**;**

2. Chemical contaminants; and

3. Physical contaminants.

The following sections discuss the various types of contaminants of concern and their effects on the health of consumers and other aspects of a water system. Figure 3 illustrates the three hazard types and provides examples of each.

Figure 3
Types Of Hazard



5.1.1 Microbiological Contaminants

In cross-connection control, waterborne diseases are the primary public health concern **(e.g., cholera, typhoid, giardiasis, and cryptosporidiosis).** Microbiological organisms that may cause waterborne disease include: bacteria, viruses, protozoa, and parasitic helminths (worms).

The risk of a waterborne disease transmitted through the public water supply is a major concern because of the:

- Large population that may be exposed to the disease in a short timeframe;

- Inability to immediately detect contamination (in fact, the first indicator may be the outbreak of disease); and

- Difficulty in tracing the contaminant source (e.g., *Giardia* cysts may enter the distribution system from a reservoir or through a cross connection with an auxiliary supply).

Contributing to the problem of assessing the relative risk to public health of a microbiological contaminant is the issue of *infectious dose*. The severity of the health effect experienced by an individual consuming drinking water containing a disease-causing microorganism varies by the:

1. Type of organism;

2. Quantity ingested; and

3. Strength of the person's immune system.

Individuals with underdeveloped or weakened immune systems, such as infants, the elderly, and persons receiving treatment for cancer, are more vulnerable to waterborne diseases than persons with fully functioning immune systems.

All microbiological contaminants in drinking water are not necessarily disease-causing organisms. However, their presence in the public water distribution system may be an indirect concern to the purveyor. For example, any coliform bacteria detected through the purveyor's monitoring program will require mitigation measures. These measures include re-sampling and possible further action such as flushing, disinfection and issuance of a boil water advisory. In addition, some microbiological contaminants may cause taste and odor problems or cause an increased chlorine demand.

In assessing the problem of bacteria entering the distribution system, the following system-specific issues should be considered (at a minimum):

1. **Source water quality.** The quality of the source water, if poor, may enhance bacterial growth and re-growth in the distribution system. For example, sources with high levels of organics will provide a food source for bacteria that may enter the distribution system due to a backflow incident. Other quality concerns include water with high turbidity, sulfide bacteria, iron and manganese, etc., that provide a biofilm (slime) or biomass (sediment) in water mains to harbor bacteria.

2. **Condition of distribution system piping**. The condition of distribution system piping, if poor, may aid bacterial growth and re-growth in the distribution system. For example, corrosive water may cause tuberculation formation on old, unlined cast iron and steel water mains. The tubercles provide a rough surface that shelters bacteria from chlorine.

3. **Status of disinfection**. Some purveyors use groundwater as a source of supply and do not chlorinate. The ability and willingness of the purveyor to carry a chlorine residual in the distribution system directly impacts bacterial survival and growth within the distribution system. Purveyors that do not routinely chlorinate their systems should be prepared (have the necessary means and a plan of action) to apply emergency disinfection to address unexpected microbiological contamination.

Concerns about microbiological contamination may be somewhat different from system to system, since each system is unique.

5.1.2 Chemical Contaminants

With chemical contaminants, the issue of toxic dose must be considered just like with microbiological contaminants. Every chemical will have some effect on the person being exposed. The severity of the health effect experienced by an individual consuming drinking water containing a chemical contaminant depends on the type of chemical, amount of chemical in the water and the duration of exposure. With chemical contaminants, the severity of health effects increases with dose, i.e., the higher the dose, the more significant the health effects. Similarly, longer exposures result in more significant health effects.

Acute toxic conditions from chemical contaminants are of most concern in cross-connection control. Similar to microbiological contaminants, the health effect to an individual consuming a toxic chemical varies by the:

1. Type of chemical;

2. Quantity ingested; and

3. Immune system of the person exposed.

For most people, the ingestion of drinking water with a high copper level will likely cause nausea, diarrhea, abdominal pain and/or headache. However, in a small portion of the population, i.e., those individuals with an allergy to copper, the health effects can be far worse (causing death).

Some chemicals may normally have low levels of toxicity to humans. However, when these chemicals are introduced into the water system via cross connections, they may react to form more toxic chemicals. This occurs when the chemicals introduced via backflow combine with the chemicals intentionally added by the purveyor to treat the water supply. Chemical contaminants may also react with the piping material in the plumbing or distribution system to leach toxic metals into the water. Other chemicals, such as gasoline, may damage piping materials (e.g., permeation of polyvinyl chloride (PVC) pipe) and lead to structural failure of the pipe.

Some chemical contaminants may adhere strongly to the distribution piping walls and/or plumbing. Once a backflow incident has introduced chemicals with this characteristic into the water system, it is extremely difficult and/or virtually impossible to completely clean/remove the contaminant from the system. There have been well-documented backflow incidents where the purveyor's only viable remedy was to replace the water main affected by the chemical contaminant.

Concerns about chemical contamination may be somewhat different from system to system, since each system is unique.

5.1.3 Physical Hazards

In addition to microbiological and chemical contaminants, purveyors need to be aware that physical contaminants can also be introduced into the water supply via cross connections. Most physical hazards are also chemical hazards. Examples of "pure" physical hazards are compressed air, hot water and steam. Hot water and/or steam, when present in the potable water supply, may result in the burning of the skin, eyes, etc., of consumers served by the water system.

Gas is another type of physical hazard. The public health risks posed by a gas, such as propane, are of an entirely different dimension and magnitude compared to the risks posed by hot water and/or steam. In addition to toxic effects, propane gas may cause an explosion.

Thus, when conducting hazard evaluations, purveyors need to be aware of potential physical hazards as well as microbiological and chemical hazards. Just like the other types of cross-connection hazards, physical hazards may cause injuries and even death in consumers served by the system.

5.2 Multiple Barrier Concept

Protection Afforded Through the Purveyor's Programs

Public health protection of drinking water emphasizes ***prevention*** of contamination and disease. This preventative approach is based on the ***multiple barrier concept*** to public health protection. With this concept, purveyors create multiple barriers or "roadblocks" between disease- causing organisms (and other contaminants) and public water system consumers. With the multiple barrier concept, the greater the number of barriers, the greater the public health protection afforded. Most programs implemented by purveyors, including CCC programs, are barriers in the multiple barrier concept to public health protection.

The major barriers established for public water systems include:

- **Protecting Sources of Supply. Source protection programs** are designed to prevent microbiological, chemical, and physical contaminants from entering the water supply. Source protection is accomplished through implementation of watershed control (surface water sources) and/or wellhead protection programs (wells).

- **Providing Treatment. Treatment processes,** such as filtration and primary disinfection, remove, reduce, and/or inactivate contaminants (naturally-occurring and human-related) from the raw water. Treatment is provided to comply with the maximum contaminant level (MCL) and treatment technique requirements established by the drinking water regulations.

- **Secondary Disinfection. Secondary disinfection** is used to maintain a disinfectant residual in the distribution system to control microbiological water quality (e.g., bacterial re-growth).

- **Storage. Storage reservoirs** provide covered storage and prevent microbiological contamination of the treated water through openings in the reservoir (e.g., screened vents, hatch seals are provided).

- **Distribution System Design.** Purveyors comply with the design, installation and material standards, and provide minimum operating pressures (e.g., greater than 20 psi during fire flow conditions) to prevent contaminants from entering the distribution system.

- **Cross-Connection Control Programs. These programs help protect the public water system from becoming contaminated via cross connections.** Purveyors require premises isolation with approved backflow preventers to prevent contaminants from entering the system from high hazard premises.

- **Water Quality Monitoring. Monitoring programs** provide a means of surveillance of the public water system to detect microbiological and/or chemical contaminants in the water supply.

- **Operation by Qualified Personnel.** Purveyors provide DOH-certified treatment plant operators, distribution system managers, and CCSs to ensure proper operation of the water system (all facilities under control of the purveyor).

- **Emergency Planning.** Purveyors establish emergency procedures for correcting problems detected in water quality monitoring, caused by natural disasters, or created by backflow incidents.

Public Health Protection Afforded Through the Plumbing Code and Plumber Certification Law

On the customer's premises, the Uniform Plumbing Code establishes minimum plumbing design, installation and operating requirements. The purpose of the code is to protect the public health, safety, and welfare of the occupants of buildings. The major elements in the plumbing code are:

- **Supply.** Owners must ensure that there is an adequate supply of piped potable water for the plumbing system.

- **Distribution.** Owners must install approved materials and follow design requirements to ensure minimum pressure at fixtures.

- **Cross-Connection Control.** Owners must provide approved backflow preventers at fixtures to prevent contaminants from entering the plumbing system (and drinking water).

In addition to the plumbing code, in Washington, there are also laws and regulations that require certified individuals to provide plumbing services within buildings. According to the plumber certification laws and regulations**,** plumbing is to be installed and repaired by certified plumbers (with some exceptions).

The public health protection requirements established by federal and state officials are very conservative. They include a high safety factor for both system design (reliability) and for acceptable levels of contaminants. For example, regulation of chemical contaminants may be based on a possible adverse health effect from the long-term (e.g., 30 years) daily consumption of two liters of water containing a chemical at a level above the maximum contaminant level (MCL).

Many of the federal Safe Drinking Water Act requirements address possible ***long-term*** health effects of contaminants to consumers. ***However, contamination of water distribution systems through backflow often results in immediate adverse health effects (illness or death of one or more persons) and/or financial losses.*** Although cross-connection control is only one of the multiple barriers to protect water quality, it is one of the most important barriers to protect the health of consumers served by a public water system.

Some governing bodies question the need for purveyors to develop and implement CCC programs. Some council and board members feel that CCC programs are a waste of time and money. ***However, cross-connection control programs are an integral barrier in the multiple barrier concept to public health protection.*** In fact, without a CCC program, the purveyor's distribution system may become the weak link in the multiple barrier approach to disease prevention.

It is illogical for purveyors to spend large amounts of money on capital improvements for source water treatment plants, water quality monitoring programs, etc., if the distribution system is vulnerable to contamination via cross connections. Also, for overall risk and liability management, the benefits of implementing CCC programs are more favorable for purveyors than incurring costs for incident investigation, cleanup, and settlement of claims.

Without a cross-connection control program, the purveyor's distribution system may become the weak link in the multiple barrier approach to disease prevention.

5.3 Legal Aspects

Once contamination occurs, one or more persons may suffer a loss. The history of backflow incidents reveals that the loss can range from a minor financial loss (e.g., the cost of flushing a plumbing system) to the death of one or more persons and a significant financial loss.

Whenever there is a backflow incident, one must assume that litigation will follow. The litigation may be based on a violation of regulations, a tort action, and/or a breach of contract.

The purveyor's cross-connection control program must be designed to reasonably **reduce the risk of contamination** of the public water system *and* should be designed to **reduce the purveyor's exposure to legal liability.**

In general, the purveyor's liability may flow from the following sources:

- Having a statutory/regulatory obligation and failing to follow it (i.e., breach of the law);
- Failing to develop a "reasonable" CCC program and/or failing to take follow-up enforcement action, once the purveyor has specific knowledge of a hazard (i.e., negligence);
- Supplying a customer with contaminated water that causes the customer to suffer a loss (e.g., breach of contract/product liability);
- Imposing unreasonable requirements on the customer (e.g., requiring an RPBA on all services);
- Extending a CCC program beyond the purveyor's jurisdiction (e.g., inspecting plumbing and enforcing the Uniform Plumbing Code); and
- Misrepresenting the actions of the purveyor (i.e., making an implied contract).

The purveyor’s liability may include:

1. Fine or imprisonment for a breach of a statute; and/or

2. Payment of monetary damages, including:

    a. Court costs;

    b. Fees of opposing lawyer;

    c. Compensatory damages; and

    d. Punitive damages.

The following is an example of a statute pertaining to the purveyor's potential liability (criminal):

Section RCW 70.54.020 Furnishing Impure Water - Penalty

> "Every owner, agent, manager, operator or other person having charge of any waterworks furnishing water for public use, who shall knowingly permit any act or omit any duty or precaution by reason whereof the purity of healthfulness of the water supplied shall become impaired, shall be guilty of a gross misdemeanor." [1909 c 249 {291;RRS} 2543]

Other statutes pertain to the purveyor's liability for payment of penalties for violation of laws or rules regulating public water systems. Under Section RCW 70.119A.030, DOH has statutory authority to impose penalties for violations of laws or rules (regulating public water systems) that are determined to be a public health emergency. Under this RCW, purveyors may be penalized up to $10,000 per day per violation.

In addition to the public health emergency penalty provision, Section RCW 70.119.040 grants DOH general authority to impose penalties for violation of laws or rules regulating public water systems. Purveyors may be penalized up to $5,000 per day per violation. Purveyors should note that when monetary damages are computed, every violation is considered a separate offense, and in the case of continuing violations, every day's continuance is a separate and distinct violation.

To reduce the exposure to liability, the purveyor should implement a CCC program that:

1. Complies with regulatory requirements set forth in the drinking water regulations (WAC 246-290-490);

2. Follows the "standards" of the water industry for the application of backflow assemblies;

3. Includes the installation of *approved* backflow prevention assemblies;

4. Includes the installation of backflow assemblies and devices in accordance with industry standards;

5. Includes the testing of backflow assemblies by a method and at a frequency stipulated in regulations and recommended by industry standards;

6. Includes the testing of backflow assemblies by *certified* testers (the certification establishes a minimum level of training of the personnel testing assemblies); and

7. Includes procedures for investigating backflow incidents and restoring water quality after an incident occurs.

Recognizing that contamination will occur, the purveyor's exposure to liability can be reduced by transferring as much responsibility, and hence, the liability, to others. This may be done by:

- Requiring isolation of the customer's premises by an approved backflow assembly commensurate with the degree of hazard, since the greatest exposure to liability for the purveyor is in the transmission of a contaminant to its customers; and

- Entering into a service contract (written agreement) with the customer to provide water service (the agreement spells out the obligations of the purveyor and customer).

A written "service contract" provides the purveyor with the best form of enforcement authority, because the customer agrees to the standards imposed by the purveyor, and any enforcement action by the purveyor may be based on the customer's breach of contract.

In the absence of specific contract terms to limit liability, all parties involved in cross-connection control will have some degree of implied responsibility. Each party is assumed to exercise "reasonable" conduct to prevent contamination of the drinking water. If a case involving damages from contamination came before the courts, assessing liability may be reduced to a question of whether the defendant:

1. Knew (or ought to have known) about the dangerous condition; and

2. Took reasonable steps within his/her control to prevent contamination of the water system.

All purveyors have a contract with their customers. Contracts can be in writing (service agreements) or implied (nothing in writing). In either case, the purveyor agrees to provide safe, reliable drinking water, and the customer agrees to pay for the water.

As stated previously, the purveyor's jurisdiction ends at the meter. Thus, the purveyor ***does not*** have a right to enter upon the customer's property, require a customer to install, test, or maintain a BPA, etc., except through the terms and conditions established by the purveyor for providing water services, i.e., in the service agreement. If the agreement is not in writing and/or is not signed by the customer, the purveyor and customer may disagree on the obligations of each party.

WAC 246-290-490 establishes the obligation of the purveyor to protect the public water system from contamination via cross connections. However the WAC does not directly or by implication, establish an obligation of the purveyor's customer to protect the public water system. For example, where mandatory premises isolation is required under Table 9 of WAC 246-290-490, the purveyor is obligated to have an assembly installed on the service. The WAC does not address who must install the assembly. ***Thus, if the customer refuses to install the assembly, the purveyor must install the assembly and may have to bear the cost associated with the installation.***

Examples of standard written *service contracts* for new and existing customers are provided in Appendix D. The purveyor's attorney should be involved in establishing all forms of contracts.

It is less expensive for purveyors to pay attorney fees for advice on how to avoid a lawsuit than to pay fees to defend in a lawsuit. The purveyor's attorney should develop or approve all customer service agreements used by the purveyor.

Chapter 6. Starting a Program

6.1 Overview

Since 1970, the drinking water regulations in Washington have included the requirement for purveyors to develop a CCC program. Yet, a 1994 DOH survey of water systems indicated that a majority of small water systems had not started a program. More recent data for 2001 indicates that even some of the largest community systems in Washington:

- Had no written CCC program plans;
- Had written programs that did not contain all of the minimum elements required in WAC 246-290-490(3); and/or
- Were not implementing their programs.

It should be noted that the minimum elements currently listed in the CCC regulations first became effective in April 1999. However, the basic elements of a cross-connection program, as outlined in water industry reference manuals (e.g., Pacific Northwest Section – American Water Works Association *Cross-Connection Control Manual*), have not changed significantly since the early 1970s.

Currently, four basic types of programs can be found in Washington. These are:

1. **Combination Programs**

   These are CCC programs in which the purveyor relies upon both premises isolation assemblies and in-premises assemblies to protect the distribution system.

   The purveyor requires premises isolation for premises of the type on the DOH mandatory list (Table 9 of WAC 246-290-490) and may choose to supplement Table 9 of WAC 246-290-490 by adding other selected customer categories. For non-high hazard premises, the purveyor relies upon backflow protection at selected points of use (high hazard fixtures) within the customer's premises. With this type of program, the purveyor makes the risk assessment. Combination programs are the predominant type of program implemented by large community water systems in Washington.

2. **Premises Isolation Programs**

   These are CCC programs in which the purveyor relies solely upon premises isolation.

   All assemblies protecting the distribution system are located at the meter (or at an alternate location acceptable to the purveyor) to isolate the customer's entire water (plumbing) system from the purveyor's distribution system.

For example, in this type of program, in addition to Table 9 of WAC 246-290-490 premises, all residential customers with special plumbing and all commercial customers are "isolated" at the meter with a DCVA or RPBA.

3. **Joint Purveyor and Local Administrative Authority Programs**

   These are programs that rely upon premises isolation for high-hazard premises (Table 9 of WAC 246-290-490 list) and in-premises assemblies and devices at selected points of use for other types of premises. The risk assessment is made through a joint program between the purveyor and Local Administrative Authority (local building/plumbing official).

   This type of program is most often selected by municipal systems.

4. **Non-Community System Programs**

   In these types of programs, protection from cross connections is afforded by compliance with both the Uniform Plumbing Code and WAC 246-290.

   This type of program is applicable where the purveyor owns the potable water system from the source of supply to the last tap. An example would be an elementary school supplied by its own well, storage tanks, treatment system, etc.

Each type of cross-connection program identified above has significantly different costs, risks, and liability implications to the purveyor. The selection of the type of CCC program to implement is a major policy decision for the purveyor. ***Senior management, in consultation with the purveyor's attorney, should make the policy decision regarding program type.***

6.2 Program Decisions

The following list identifies the fundamental policy decisions the purveyor needs to make regarding the development and implementation of a CCC program. Once made, the policies may be changed in the future. However, some policy changes are more difficult to make than others, once a program has been initially implemented.

The major policy decisions are:

1. Program Type (e.g., premises isolation only);

2. Extent of Coordination (with Local Administrative Authority);

3. Corrective Action;

4. Service Agreements;

5. Location & Ownership of Premises Isolation Assemblies;

6. Cross-Connection Specialist Options;

7. Testing of Assembly Options; and

8. Cost Recovery.

Each of these decisions will be discussed in detail below. At the end of each section, a table is provided for the purveyor to record the policy decision made.

6.2.1 Types of Programs

A CCC program may be based upon either:

- Premises isolation protection only; or

- A combination of premises isolation and in-premises protection.

Premises isolation means a method of protecting a public water system (i.e., the purveyor's system) by installation of DOH-approved AGs or backflow prevention assemblies installed at or near the service connection (or alternate location acceptable to the purveyor) to isolate the customer's water system from the purveyor's distribution system. For high hazard premises, premises isolation is accomplished by installation of an approved AG or DOH-approved RPBA on the service.

For all CCC program types, mandatory premises isolation is required for high health hazard premises (hospitals, medical clinics, etc.). Table 9 of WAC 246-290-490 lists a number of categories of premises where an AG or RPBA is required for premises isolation. It should be noted that the high-hazard premises table in the WAC is not all-inclusive, and other types of premises considered to pose a high health hazard also require mandatory isolation with an AG or RPBA. Examples of other high hazard premises would include: airline manufacturing plants, paper mills, and military bases. Table 2 is a copy of the high-hazard premises list from the WAC.

If the customer's property use corresponds to the risk assessment for the category (e.g., medical clinic), premises isolation is mandatory. The only exception is where a customer's business practices and activities don't match the category, i.e., the business name or description is misleading. For example, a "medical clinic" may only include psychologists. The health hazard posed by an office of psychologists is not the same as a typical medical clinic with physicians, laboratories doing blood work, cultures, providing diagnostic services such as x-rays, etc. In cases where the customer's business practices aren't consistent with the hazards normally associated with that category of business, the purveyor may grant an exception to mandatory premises isolation.

Table 2
High Health Hazard Premises
Requiring Isolation by AG or RPBA

Agricultural (farms and dairies)
Beverage bottling plants
Car washes
Chemical plants
Commercial laundries and dry cleaners
Premises where both reclaimed water and potable water are provided
Film processing facilities
Food processing plants
Hospitals, medical centers, nursing homes, veterinary, medical and dental clinics, and blood plasma centers
Premises with separate (i.e., dedicated) irrigation systems that use the purveyor's water supply and with chemical addition*****
Laboratories
Metal plating industries
Mortuaries
Petroleum processing or storage plants
Piers and docks
Radioactive material processing plants or nuclear reactors [+]
Survey access denied or restricted
Wastewater lift stations and pumping stations
Wastewater treatment plants [+]
Premises with an unapproved auxiliary water supply interconnected with the potable water supply

*For example, parks, playgrounds, golf courses, cemeteries, estates, etc.

[+] ***RPBAs for connections serving these premises are acceptable only when used in combination with an in-plant approved AG;*** otherwise, the purveyor shall require an approved AG at the service connection.

Under WAC 246-290-490, the purveyor has an obligation to protect the public water system from contamination. The purveyor's customers and the Local Administrative Authority (plumbing inspector/ health inspector) have the obligation to prevent contamination of the potable water system within the property lines of the customer's premises.

When establishing a cross-connection control program, the purveyor must first determine what level of overall risk and potential liability is acceptable. Whenever the purveyor relies on in-premises backflow preventers, the purveyor accepts increased risk and liability over premises isolation due to:

- The potential for the plumbing system to be changed by the customer without the purveyor's knowledge and/or approval of the Local Administrative Authority; and

- The potential for the customer to fail to test, maintain, and repair the backflow preventers the purveyor relies on to protect the public water system.

Purveyors should consider all customers served by the public water system to pose a health risk for contamination of the water distribution system. The health risk increases with the complexity of the customer's plumbing system, uses of water (i.e., on-site activities, processes), etc.

No plumbing system should be considered free of cross connections. However, for many plumbing systems (e.g., residential homes), with the normal cross-connection protection afforded through compliance with the Uniform Plumbing Code, the risk of contamination to the purveyor's distribution system is typically relatively low.

Premises Isolation Programs

For a premises isolation program, an assessment must be made of the degree of hazard posed by the customer to the public water system. Based on this assessment, if the degree of hazard is such that the purveyor believes premises isolation is needed, an approved backflow prevention assembly commensurate with the degree of hazard must be installed on the service connection.

A periodic re-evaluation of customers must be conducted to confirm that the premises isolation decision initially made is still valid. If not, the appropriate backflow assembly must be installed on the service. This could be an installation where no assembly was previously required or an upgrade to an RPBA from a previously required DCVA (for a change in the customer's water use).

The minimum premises isolation program would consist of:

1. Identifying all customers of the high health hazard type such as those categories listed in Table 9 of WAC 246-290-490; and

2. Ensuring the installation of the required RPBA or AG.

The minimum premises isolation program offers the purveyor the minimum level of public health protection and liability management. For this reason, a premises isolation program normally includes an expanded list of categories requiring premises isolation.

An expanded list of premises isolation categories may be based upon a customer category system of classification for assessing health risk. For example, a DCVA may be required as the minimum premises isolation for all shopping malls. The purveyor's risk assessment then reduces to determining if there are any categories of tenants (e.g., dental or medical clinic) in the shopping mall that require the premises isolation requirement to be increased to an RPBA (e.g., the mall could include a medical clinic).

When considering additions to Table 9 of WAC 246-290-490, purveyors need to be aware that the expanded list does not need to be limited to shopping malls. It could also include all commercial customers. Purveyors could define commercial customers as all customers other than single family and duplex residential customers. Under this approach, all tall buildings, apartments, etc., would be included in a general risk category requiring at least a DCVA for premises isolation.

Combination Programs (Reliance on Premises Isolation and In-Premises Assemblies)

In a combination program, the purveyor may rely on in-premises backflow assemblies (at the plumbing fixture) for all non high-hazard connections (i.e., where premises isolation is not mandated). The need to assess the degree of hazard posed by the customer on the distribution system does not change. However, the purveyor must determine what individual plumbing hazards (fixtures) must be isolated with approved backflow assemblies to provide protection (equivalent to premises isolation) for the distribution system.

Part of the in-premises risk assessment should include the potential for plumbing to be changed without the purveyor's knowledge. For example, strip malls with frequent changes in tenants pose an increased risk to the public water system. For example, a clothing retail store could be replaced by a camera store with a photo lab without the purveyor's knowledge. This would increase the risk to the purveyor's system. The purveyor would need to conduct relatively frequent re-surveys of the mall to ensure that new cross connections are detected, or add the mall to the supplemental list of customers requiring premises isolation.

Part of the overall hazard assessment should also include an assessment of the complexity of the building's plumbing. ***As the complexity of the piping increases, the risk of not identifying a cross connection increases.***

Tall buildings or buildings built on a hill above the street (water main elevation) also increase the risk of backflow into the purveyor's system from backpressure. For example, a small drop in the purveyor's system pressure may allow backflow to occur. For these reasons, WAC 246-290-490 gives purveyors the authority to require premises isolation on premises that have characteristics such as:

1. Complex plumbing arrangements or plumbing potentially subject to frequent changes that make it impractical to assess whether cross-connection hazards exist;

2. A repeat history of cross connections being established or reestablished; or

3. Cross-connection hazards that are unavoidable or not correctable, such as, but not limited to tall buildings.

It should be noted that the in-premises protection provided by the customer in accordance with the Uniform Plumbing Code may not be commensurate with the purveyor's assessed degree of hazard. This is often the case with old buildings. Once the customer complies with the Uniform Plumbing Code in effect at the time of construction, the customer is "vested." The Local Administrative Authority can't require changes/upgrades (e.g., addition of an RPBA) to the existing plumbing system, unless the building is significantly remodeled. Thus, the Uniform Plumbing Code basically "grandfathers" the plumbing systems of existing buildings, and their owners are essentially exempt from requirements imposed by later versions of the Uniform Plumbing Code.

The purveyor can't require the customer to make plumbing changes, since enforcement of the Uniform Plumbing Code falls under the jurisdiction of the Local Administrative Authority. However, the purveyor may offer the customer the option to voluntarily make a plumbing change (e.g., install a backflow assembly at a fixture) in lieu of installing a larger, more expensive backflow assembly on the service. The advantages to the customer are:

- Possibly lower cost of installation (two 3/4-inch assemblies within a building may cost less than a one 1-inch assembly located outside the premises in a vault or above ground enclosure); and

- Greater health protection for the occupants of the building, since the assembly on the service only protects the neighboring customers served by the public water system *and not the occupants of the building.*

The disadvantage to the customer is that the cost of testing and maintaining multiple in-premises assemblies may be greater than the cost associated with the single-premises isolation assembly. Thus, the customer's long-term testing and maintenance costs for the in-premises backflow assemblies may outweigh the initial savings in purchase price and installation costs.

WAC 246-290-490 requires the purveyor to protect the distribution system from contamination via cross connections.

If the customer doesn't agree to install a premises isolation assembly or equivalent in-premises protection at the fixture, the purveyor must install a premises isolation assembly on the customer's service.

The above sections have discussed two major types of cross-connection programs that purveyors can implement to comply with WAC 246-290-490. Table 3 (below) summarizes the major advantages and disadvantages of a premises isolation program vs. a combination program.

Table 3
Type of Program Options

	Type of Program	
	Premises Isolation Only	***Combination Program***
Major Advantages	Lowers the purveyor's costs and workload by reducing the number of assemblies to be monitored and the time spent on re-surveys.	Reduces customer's costs by eliminating an additional, possibly large, assembly on the service.
Major Disadvantages	Increases customer's risk. Increases pressure loss in customer's system. Increases customer's cost.	Increases the purveyor's risk, due to unreported plumbing changes and undetected/unprotected cross connections. Increases purveyor's workload and cost for administration.

Purveyors can use the following table to document the policy decision made regarding what type of CCC program to implement.

Decision - Type of Program (check one)	
	Premises Isolation Only
	Combination (premises isolation and in-premises)

6.2.2 Extent of Coordination

WAC 246-290-490 requires purveyors to ***coordinate*** with the Local Administrative Authority on CCC matters. Similarly, the Uniform Plumbing Code (as amended for Washington) requires the Local Administrative Authority to coordinate with the purveyor on CCC matters. The level of coordination with the Local Administrative Authority may vary. Coordination options include:

- A simple exchange of information (minimum effort);
- Interacting (cooperating) with the Local Administrative Authority; or
- Operating a combined (joint) purveyor/Local Authority program.

Each of these will be discussed in more detail below.

Exchange of Information Program

For an ***exchange of information level of coordination***, the purveyor should:

1. Notify the Local Administrative Authority (local building official/plumbing inspector) of the purveyor's CCC program type (e.g., premises isolation) and policies;
2. Request to be notified by the Local Administrative Authority of all permits for new premises and for permits for plumbing changes to existing premises served by the public water system; and
3. Notify the Local Administrative Authority of any enforcement action in which water service is discontinued and of any backflow incidents known by the purveyor to have contaminated the public water system or the customer's plumbing system.

Note: Purveyors that initially select the information exchange option can always upgrade the level of coordination to an *interaction type of coordination* in the future.

WAC 246-290-490 does not require purveyors to enter into written agreements with Local Administrative Authorities. However, written agreements are strongly recommended for purveyors who decide to implement joint programs.

The level of coordination must be described in the purveyor's written CCC program plan. A sample program plan is provided in Appendix A.

Interaction Level of Coordination

For an ***interaction level of coordination*** (cooperation) with the Local Administrative Authority, the purveyor may:

- Conduct joint surveys/inspections of the customer's premises; and
- Share assembly location and testing information.

An interaction level of coordination is only feasible where the Local Administrative Authority's:

- Staff is knowledgeable about/has expertise in cross-connection control; and
- Staff resources are adequate to participate.

Combined/Joint Program Level of Coordination

Purveyors that wish to implement a ***combined/joint program*** with the Local Administrative Authority should establish:

- Which agency (purveyor vs. Local Administrative Authority) will be in overall charge (take the lead) of the joint CCC program;
- With the Local Administrative Authority, a written agreement that clearly delineates the authority and responsibility of each agency with regards to cross-connection control; and
- A list of the tasks to be performed by each agency (i.e., the purveyor and Local Administrative Authority). For example, the purveyor agrees to maintain the database of all assemblies (i.e., premises isolation assemblies *and* fixture protection assemblies) and their test results, etc. The Local Administrative Authority conducts all plan reviews.

Combined (joint) programs work best in situations where both the purveyor and Local Administrative Authority fall under the same governmental entity (i.e., city or town).

In joint programs, it is common for purveyors to delegate responsibilities to the Local Administrative Authority. Similarly, in joint programs, purveyors often accept responsibilities from the Local Administrative Authority. In both cases, these responsibilities are often not within the jurisdiction of the purveyor or the Local Administrative Authority respectively. Special care should be taken to consider the purveyor's potential liability when the written agreement is drafted.

Table 4 shows the recommended extent of coordination based on system size and/or situation.

Table 4
Coordination with Local Administrative Authority Options

Extent of Coordination – Recommended Application		
Information Exchange	***Interaction***	***Combined (Joint) Programs***
Most suitable for small water systems.	Practical only where Local Administrative Authority has resources.	Normally recommended where both the Purveyor and Local Administrative Authority fall under the jurisdiction of the same governmental entity (i.e., city or town).

Written Agreements

Although not required in the WAC, purveyors wanting to implement joint programs are encouraged to develop written agreements with their Local Administrative Authorities.

There are a number of topics that should be considered when the water purveyor and Local Administrative Authority develop a written agreement to implement a joint program. At a minimum, the written agreement should:

1. Define the purpose of the joint program;
2. Identify the parties to the agreement;
3. Define terms used in the agreement (e.g., health hazard);
4. Cite the regulations that the combined program is based upon (e.g., WAC 246-290, UPC);
5. Cite the authority (e.g., ordinance or council vote) to enter into a written agreement and implement a combined program;
6. List the technical references used (e.g., PNWS-AWWA Manual, USC Manual, etc.);
7. Describe the general policy regarding type of program to be implemented (e.g., premises isolation per Table 9 of WAC 246-290-490 with in-premises backflow protection for all other facilities);

8. Delineate the respective responsibilities of the purveyor and Local Administrative Authority;

9. Identify the responsibilities that have been delegated to or by the purveyor and Local Administrative Authority respectively;

10. Describe administration procedures;

11. Designate the entity/person ultimately responsible for overall program supervision (i.e., who has the lead, the purveyor or the Local Administrative Authority);

12. Provide detailed operating procedures for:

    a. New construction plan review;

    b. Authorization for connection of new service;

    c. Conducting initial and periodic hazard assessments (surveys); and

    d. Communicating with customers.

13. Include procedures for responding to:

    a. General water quality complaints;

    b. Health-related complaints; and

    c. Backflow incident investigations.

14. Describe enforcement procedures for:

    a. Addressing Uniform Plumbing Code violations; and

    b. Ensuring compliance with WAC 246-290-490.

15. Identify certified backflow assembly tester (BAT) and CCS requirements;

16. Include procedures for record-keeping and notifying customers for testing, etc.;
17. Include procedures for meeting all of DOH reporting requirements;

18. Contain provisions for amending and/or canceling the written agreement; and

19. Delineate responsibilities for various program costs, cost recovery and transfer of funds between the purveyor and the Local Administrative Authority.

The requirements of a joint program must be consistent with the cross-connection control requirements of the individual purveyor and Local Administrative Authorities.

The purveyor can use the following table to document the decision made regarding the extent of coordination with the Local Administrative Authority.

Decision - Extent of Coordination (check one)	
	Information Exchange
	Interaction
	Combined/Joint Program

6.2.3 Relationship to Customer

Another major policy decision for the purveyor is how to formalize the business relationship between the purveyor and the customers. This applies to more than the CCC program issues. Whether the purveyor is a private individual, a homeowner's association or a level of government (e.g., water district), good business practices should be followed.

Service agreements are one tool that purveyors can use to formalize the business relationship with their customers. ***The purpose of a service agreement is to make clear to the customer the:***

- ***Legally binding conditions of service; and***
- ***Remedy afforded to the purveyor for the customer's breach of contract.***

At a minimum, a service agreement should:

1. Be in writing and signed by the customer or authorized agent of the customer;

2. Be short, but explicit (in that the customer agrees to the service policy of the purveyor including the CCC requirements);

3. Clearly state the corrective action the purveyor will take, when the customer fails to comply with the agreement; and

4. Include by attachment the purveyor's written service policy and standards.

Every customer obtains water service by agreement. The agreement may be verbal or written. Initially the agreement (contract) may be in the form of the customer requesting to purchase a water service connection, his payment of the connection fee, and the purveyor installing the service and meter. Thereafter, the agreement may continue in the form of the customer's payment of the water bill.

At the time of customer's application for service, the purveyor had a policy (terms) for providing service. The terms may have been limited to the customer's payment of a monthly bill. Any detailed policy (contract conditions) may not have been communicated to the customer. The policy may not have expressly covered cross connections.

At the time of the application for service, or subsequently, the purveyor may:

- Review the customer's plumbing plans and/or conduct a cross-connection survey to assess the hazard posed to the purveyor's system;

- Request, as a result of the hazard assessment from the plan review and/or survey, the installation of premises isolation or in-premises backflow assemblies to protect the water distribution system; or

- Accept the protection afforded by existing backflow preventers.

If the purveyor chose not to conduct a plan review and/or hazard survey, by default, the purveyor accepted the protection afforded by the existing backflow preventers (e.g., provided under the Uniform Plumbing Code).

Historically, when requesting a customer to install backflow preventer, purveyors commonly:

- Notified the customer in writing of the results of a CCC plan review and/or survey;

- Specified the required backflow preventers; and

- Notified the customer of the requirement for testing upon installation and thereafter annually, etc.

This written request to comply with the purveyor's conditions for service was accepted by the customer through the act of installing the backflow preventers.

The purveyor then relied upon the customer's installation, testing, maintenance, and repair of the in-premises or premises isolation approved backflow preventers and other in-premises backflow devices to protect the public water system. This agreement between the purveyor and customer was reaffirmed each year with the request to the customer to have the approved assemblies tested by a DOH-certified BAT.

The customer may not have been informed of the purveyor's service policy to:

1. Discontinue water service, if the customer failed to comply with the requirement for testing, maintenance, etc., (unless the customer is issued a second notice);

2. Require the customer to install a backflow preventer for premises isolation on the service pipe; or

3. Install a backflow preventer for premises isolation on the customer's service line, if the customer failed to do so when requested by the purveyors.

If the above scenario is currently applicable to the system, **it is recommended that the purveyor request that existing customers sign a written service agreement.** If the purveyor chooses not to pursue this independently, the first opportunity to require the customer to sign a service agreement should be taken advantage of. The opportunity may arise with:

1. Request for a new or additional connection;

2. Change in ownership of premises; and/or

3. Change of water use on the premises (e.g., through building expansion, change from residential to commercial customer category, etc.).

Unless the service agreement is recorded with the title to the property, the new owner of a building is normally not aware of the terms of the service agreement with the purveyor. The purveyor needs to reaffirm this information with the "new customer."

For existing customers without service agreements, the purveyor may incorporate the written service agreement into the notice to the customer to test assemblies or submit a hazard survey. The letter could include the following statements:

- In the past, the purveyor requested the installation of one or more backflow assemblies within the customer's premises to protect the water distribution system;
- By the customer's compliance with the purveyor's request, the purveyor agreed not to require the installation of a backflow assembly on the service;
- This benefits the customer by providing protection for both the customer's plumbing system (and family) and the water distribution system;
- To continue with this arrangement, the customer must have the assemblies tested by a DOH-certified BAT and maintained, repaired, or replaced as needed to assure performance;
- By completing and returning the attached assembly test report form, the customer agrees to continue the agreement to provide in-premises protection (rather than have the purveyor install an assembly on the customer's water service and invoice the customer for the installation cost, annual maintenance cost); and
- The customer may chose to install an assembly on his service pipe in lieu of the in-premises assemblies; however, such installation will not relieve the customer of his responsibility to comply with the requirements of the Uniform Plumbing Code enforced by the Local Administrative Authority.

The letter and accompanying assembly test form will likely document the initial agreement now forgotten by the customer, lost by the purveyor, etc. Sample written service agreements are included in Appendix D.

All agreements should be prepared by or approved as to form by the purveyor's attorney.

Table 5 summarizes the major advantages and disadvantages of having written service agreements.

Table 5
Relationship with Customers Options

	Relationship with Customers	
	Service Agreements	***Ordinance and Implied Contract***
Major Advantages	Reduces purveyor's exposure to liability for enforcement of corrective action.	Requires least administration by purveyor. Doesn't raise any issues with existing customers.
Major Disadvantages	Increases purveyor's administrative costs.	Increases purveyor's exposure to legal liability for enforcement action.

Purveyors can use the following table to document whether their business relationship with customers will be formalized through written service agreements.

Decision - Relationship with Customers	
	Written service agreement/contract signed by customer
	Ordinance/resolution; implied service agreement with customer

6.2.4 Enforcement of Corrective Actions [Element 1]

Per WAC 246-290-490 (3), when establishing authority to implement a CCC program, purveyors must describe the corrective action used to ensure that consumers comply with the purveyor's CCC requirements. For reliance on in-premises assemblies and/or premises isolation assemblies owned by the customer, the purveyor must make provisions for corrective action to be taken if the customer:

1. Fails to test or maintain the assemblies; or

2. Makes a change to the plumbing system that necessitates the installation of additional assemblies and/or different types of assemblies.

Prior to April 1999, the cross-connection regulations included the following requirement:

> "When an existing cross connection poses a potential health or system hazard, the purveyor shall shut off water service to the premises, until the cross connection had been eliminated or controlled by the installation of a proper backflow prevention assembly."

The *current* WAC (effective April, 1999) states:

"The purveyor shall take appropriate corrective action **within its authority** if:

1. A cross connection exists that is not controlled commensurate to the degree of hazard assessed by the purveyor; or

2. A consumer fails to comply with the purveyor's requirements regarding the installation, inspection, testing, maintenance, or repair of an approved backflow preventer required by this chapter."

The current WAC continues with the following:

"The purveyor's corrective action may include, but is not limited to:

1. Denying or discontinuing water service to a consumer's premises until the cross-connection hazard is eliminated or controlled to the satisfaction of the purveyor;

2. Requiring the consumer to install an approved backflow preventer for premises isolation commensurate with the degree of hazard; or

3. The purveyor installing an approved backflow preventer for premises isolation commensurate with the degree of hazard."

WAC 246-290-490 states that a purveyor denying or discontinuing water service to a customer's premises for "corrective action" shall notify the Local Administrative Authority (**not Washington State Department Of Health**) prior to taking action, except in the event of an emergency.

The failure of a customer to comply with purveyor's requirement for inspection, testing, etc., may constitute a *potential* health hazard, but not an *actual* health hazard. A backflow assembly that fails the annual test may continue to stop backflow. However, it may do so with less of a safety factor.

The purveyor has the right to discontinue water service to a customer to protect the water distribution system. However, the unreasonable exercise of this right may expose the purveyor to liability. The shut off of a water service may cause:

1. A significant financial loss to the customer;

2. Backsiphonage conditions that may result in a backflow incident within the customer's premises; and

3. A public health hazard to employees and/or residents of the premises (e.g., apartment building) from a backflow incident; the lack of water supply for domestic use, fire sprinkler systems, kidney dialysis, etc; and the lack of operating sanitary facilities (e.g., toilets).

As a corrective action, if the purveyor shuts off water service to a customer, based on an assessment of health risk, the purveyor has the burden of proof that the actions were reasonable. There are certain situations, i.e., public health emergencies, where the shut-off of water to a specific connection is needed to protect the public water system from contamination. Examples would include unprotected cross connections to sewage and when a backflow incident is occurring or has just occurred.

For situations other than the public health emergencies cited above, rather than face the burden of proof, the purveyor may wish to take an alternate corrective action, i.e., installing a backflow assembly on the service. Alternatively, the purveyor may wish to establish with the customer service agreements (contracts) that provide a legal protection for corrective action.

The purveyor's service policy should include provisions for recovering all of the purveyor's costs associated with the corrective action.

Table 6 summarizes the advantages and disadvantages of the two main corrective action options available to purveyors. Many purveyors include both types of corrective actions in their programs, but limit the use of water shut-off to emergency type situations.

Table 6
Primary Enforcement Options

	Type of Corrective Action	
	Shut Off Water Service	***Install Premises Isolation Assembly****
Major Advantages	Provides the most immediate protection of purveyor's system. Purveyor ensures protection of system.	Least exposure to legal liability. Avoids public health issues relating to lack of water supply.
Major Disadvantages	Increased exposure to liability for damages from shut-off of water.	Additional cost of premises isolation assembly. Purveyor must bear cost or collect from customer, or must rely on customer–owned assembly for premises isolation.

***** Purveyors choosing this type of corrective action have the option to install and own the premises isolation assembly themselves, or to have the customer install and own the assembly.

Purveyors may use the following table to document their decisions regarding enforcement of their CCC programs. As discussed above, purveyors can include both types of corrective actions in their written program plans and identify the one that will be the most commonly used means of enforcing the program (i.e., purveyor installed backflow preventer).

Decision - Enforcement Action	
	Rely upon shut-off of water
	Rely upon purveyor-installed premises isolation backflow preventers

6.2.5 Initial Assessment and Periodic Re-Assessment of Hazard [Element 2]

WAC 246-290-490 requires the purveyor to ensure that a CCS:

- Assesses the degree of hazard posed by the consumer's water system upon the purveyor's distribution system; and

- Determines the appropriate method of backflow protection.

Thus, after the basic foundation of the program has been accomplished, the implementation of an on-going CCC program starts with the assessment of the level of hazard posed by various

connections served by the system. More than any other aspect of a CCC program, the training, expertise and experience of a DOH-certified CCS is called upon to properly accomplish this task.

The ***initial*** assessment of a service connection or premises refers to either the:

1. Assessment conducted prior to service being initiated for a ***new*** service connection; or

2. First time an assessment is performed for an ***existing*** service connection.

After the initial assessment, the CCC regulations require periodic re-assessment of the service connection to evaluate the appropriateness of the existing level of cross-connection protection.

To comply with these regulatory requirements, the following options are available to the purveyor:

1. The purveyor's certified CCS (on staff or contractor) makes the initial assessment of degree of hazard and periodic re-evaluations; or

2. Each customer is required to hire a private CCS (contractor) to conduct the hazard survey and submit a report to the purveyor.

Option 2 offers the major advantage to the purveyor of transferring the cost of the initial evaluation and re-evaluation of commercial customers (and other customers with complex plumbing) from the purveyor to the customer.

With Option 2, the purveyor's certified CCS should review the hazard evaluation report submitted by the customer's CCS. The purveyor's CCS review may be done as part of the periodic program review (e.g., once per year), provided the system's CCC Program Manager is given general review guidelines on reviewing reports from customers. Table 7 summarizes the advantages and disadvantages of the two hazard assessment options.

Table 7
Cross-Connection Control Specialist (CSS) Options for Assessment of Degree of Hazard

	Initial Assessment and Re-Assessment of Hazard	
	By Purveyor's CCS (on Staff or Contractor)	***CCS Hired by Customer to Submit Report to Purveyor***
Major Advantages	Assures the quality and consistency of the hazard assessment process. Equitable assessment process for all customers.	Places cost upon customers with cross-connection hazards. Increases customer responsibility and liability. Hazard assessment may be combined with assembly testing.
Major Disadvantages	Cost borne by all the customers.	Doesn't assure quality or consistency of hazard assessments. CCS hazard assessment may be subject to customer influence.

The purveyor can use the following table to document the decision regarding whose CCS will be responsible for conducting initial hazard evaluations and periodic re-evaluations.

Decision - Assessment & Re-Assessment of Hazard	
	By purveyor's CCS (on staff or contractor)
	By customer-employed CCS, with report reviewed by purveyor's CCS

6.2.6 Location and Ownership of Premises Isolation Assemblies [Element 3]

Element 3 of the cross-connection regulations requires the purveyor to develop and implement procedures for ensuring that cross connections are controlled by the installation of approved backflow preventers commensurate with the degree of hazard. Regardless of the type of program implemented (premises isolation vs. a combination program), the purveyor must decide on the issues of ownership and installation location for all premises isolation backflow preventers.

The general options available to the purveyor are premises isolation backflow preventer owned by the:

1. Purveyor and installed with the meter on the public right-of-way (ROW) or in a utility easement along side the public ROW; or
2. Customer and installed on the service line on the customer's side of the property line

either:

a. Immediately downstream of the meter; or

b. Downstream of the meter, before the service line enters the building or in the mechanical room where the service line just enters the building, with no connections between the meter and the backflow preventer.

Illustrations 4-6 show three ownership/location combinations for premises isolation assemblies.

Premises isolation is defined as ... "the installation of approved AGs or approved backflow prevention assemblies **at or near the service connection (**or **alternate location** acceptable to the purveyor) to isolate the consumer's water system from the purveyor's distribution system."

Illustration 4
Purveyor-Owned Premises Isolation Assembly Installed at Meter

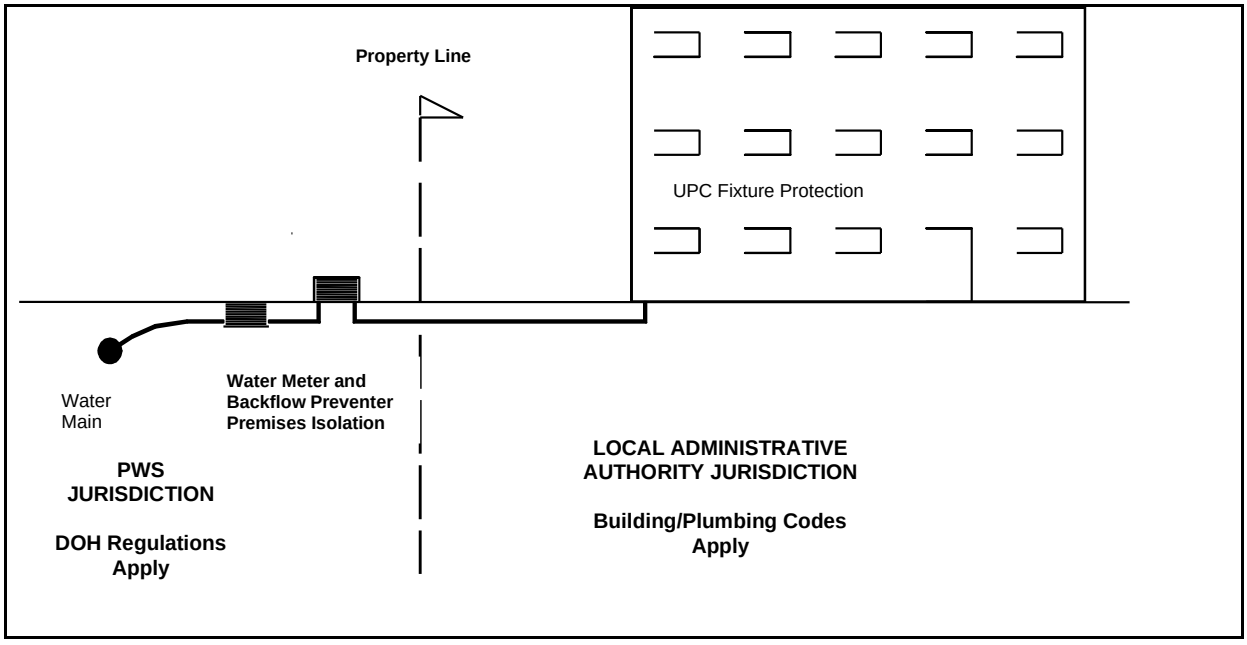


Illustration 5
Customer-Owned Premises Isolation Assembly Installed *Immediately Downstream of Meter*

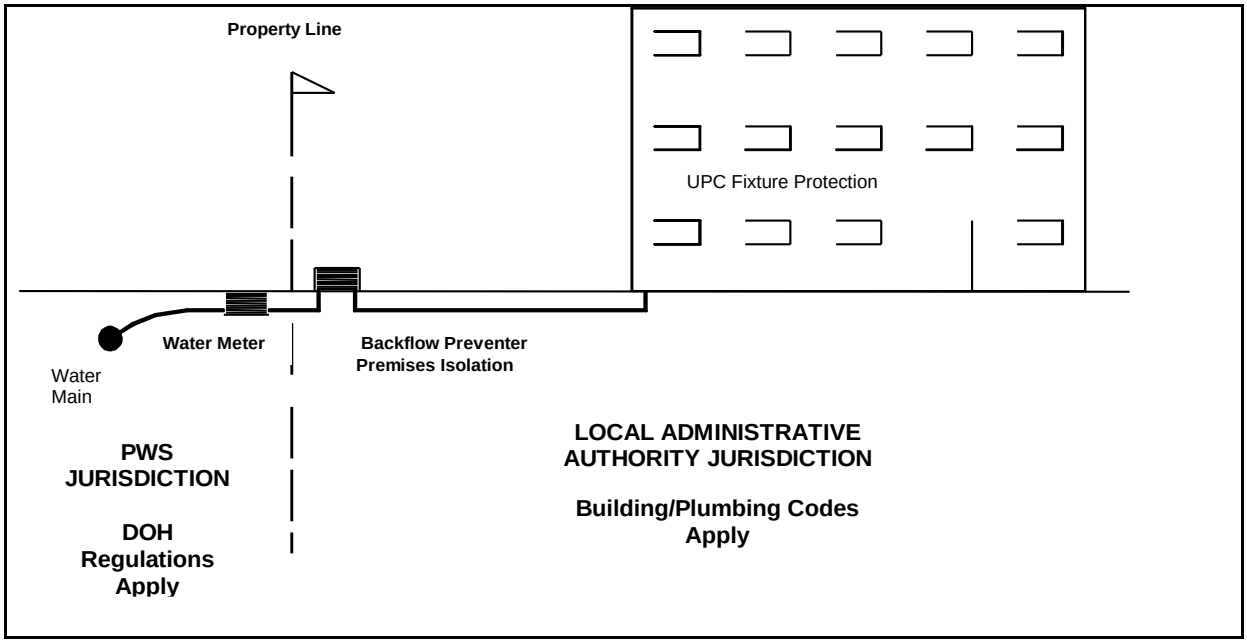
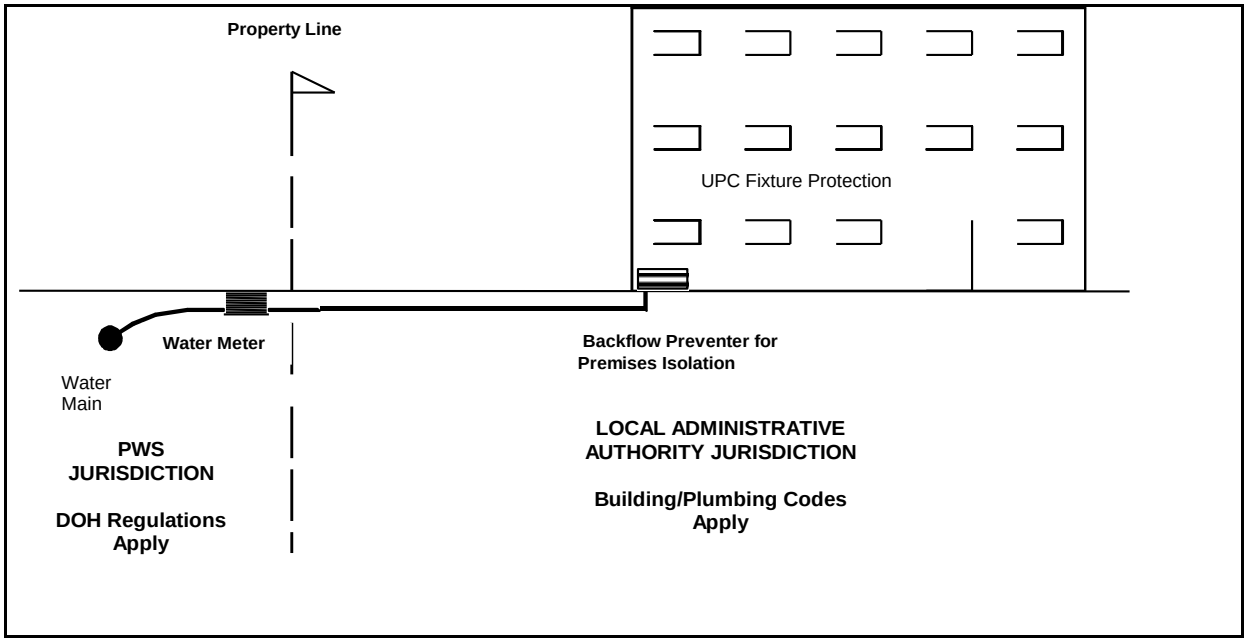


Illustration 6
Customer-Owned Premises Isolation Assembly Installed at an "Alternate Location" Acceptable to Purveyor*



* No connections between the meter and premises isolation assembly, unless the connection is specifically approved by the purveyor.

Purveyors face an increased risk when they accept a customer-installed premises isolation assembly at a location other than immediately downstream of the purveyor's meter (i.e., at the property line). The risk comes from the potential for connections to be made to the customer's service pipe without the purveyor's knowledge. A common "alternate location" is the mechanical room of a building where the BPA is protected from freezing. This may offer a major cost savings for the customer over construction of an insulated, heated enclosure for a BPA immediately downstream of the meter. ***However, with this arrangement, the customer receives the benefit, while the purveyor accepts the increased risk.***

The major advantage to the purveyor's ownership of premises isolation assemblies is the increase in the reliability of the assemblies that protect the public water system. The increased reliability results from the fact that the purveyor purchases, installs, tests, maintains, and repairs the assemblies. The major advantage to the purveyor of the customer owning the assembly is avoiding the responsibility (and cost) for purchase, installation, maintenance, repairs, or replacement and the accompanying potential liability for assembly failure. These advantages and disadvantages are summarized in Table 8.

Table 8
Mandatory/Supplemental Premises Isolation Assembly Location Options

	Location of Assembly for Premises Isolation	
	On Purveyor's Service Line (With Meter)	***On Customer's Service Line (Downstream of Meter)***
Major Advantages	Reduces purveyor's risk, since purveyor assures testing and maintenance. Increases invested capital for systems regulated by Washington Utilities and Transportation Commission, and thus, supports rate increases. Eliminates enforcement issues for purveyor when customers fail to test and maintain assemblies.	Lowers purveyor's capital improvement costs. Places cost of protecting distribution system upon customers that are creating the hazards. Places responsibility for performance (and liability) upon customer.
Major Disadvantages	Increases purveyor's cost for administration of program (employing certified BAT). Increases purveyor's operating costs. Requires easement, if space is limited in public right-of-way.	Requires corrective action, if customer fails to test and maintain assembly.

The purveyor can use the following table to document the decision regarding location and ownership of the premises isolation assemblies.

Decision - Location & Ownership of Premises Isolation Assembly (check one)	
	Owned by the purveyor and located on purveyor's service line
	Owned by the customer and located on customer's service line

6.2.7 Cross-Connection Specialist Options [Element 4]

WAC 246-290-490 (3) requires personnel, including at least one person certified as a cross-connection specialist (CCS) to be provided to develop and implement the CCC program. The options available to comply with the CCS requirement are:

1. Purveyor's staff member obtains CCS certification;

2. Purveyor contracts with another water utility or agency (e.g., the Local Administrative Authority, satellite management agency, etc.) to use the services of their CCS; or

3. Purveyor contracts with an independent CCS to provide services.

RCW 70.119 governs DOH's certification of CCSs and BATs. The involvement of a CCS to "develop and implement" a program varies with the type of program. For example, in a premises isolation program that follows a policy of requiring backflow assemblies only for customers included in Table 9 of WAC 246-290-490 (mandatory list), the need for the services of a CCS would be minimal. Table 9 of this manual summarizes the advantages and disadvantages of the three CCS options available to the purveyor.

Table 9
Cross-Connection Control Specialist (CCS) Options to Implement Purveyor's Program

	Purveyor's Program – CCS Options		
	Purveyor's Staff Member Certified	***Contract with Another Utility or Agency***	***Contract with Consultant CCS***
Major Advantages	CCS is readily available. Minimum cost.	CCS will likely have more experience.	CCS will likely have the most experience.
Major Disadvantages	Potential staff turnover. Experience may be limited. May require training.	CCS may not be readily available Requires interagency agreement.	CCS may not be readily available. Requires service contract.

The purveyor can use the following table to document the policy decision made regarding the CCS.

Decision - Cross-Connection Control Specialist (CSS) Option to Implement the Purveyor's Program Management	
	Purveyor's staff member certified
	Inter-agency agreement to use another agency's CCS
	Contract with consultant CCS

6.2.8 Assembly Testing Options [Element 5]

WAC 246-290-490(3) requires the purveyor to develop and implement procedures to ensure that approved backflow preventers are inspected and/or tested. Thus, regardless of the type of program implemented (premises isolation vs. a combination program), the purveyor must establish a policy for the testing of assemblies **relied upon by the purveyor** to protect the distribution system. The general options are:

1. Purveyor's backflow assembly tester (BAT), on staff or a contractor, tests all assemblies; or

2. Purveyor requires the customer to hire a BAT.

The purveyor shall ensure that a DOH-certified BAT tests approved backflow prevention assemblies (relied upon by the purveyor) for proper operation. [WAC 246-290-490 (7)]

Having the purveyor's BAT (staff or contractor) perform the tests has the advantage of:

1. Increased reliability (quality control over testing) and thus, decreased potential liability (backflow incident);

2. Less administrative cost for the purveyor (notification letters, quality assurance, etc.); and

3. Good public relations, because the customer is not responsible for the task.

Testing by the purveyor's staff or contractor BAT has the disadvantages of the purveyor incurring:

1. Possible liability for an assembly failure; and

2. Increased costs for staff.

In programs where the purveyor requires the customer to hire a BAT, the purveyor should provide the customer with a list of local contractor BATs (see Section 7 for details) that have met the purveyor's criteria to test. Although not currently available, a public listing of certified BATs should be available from DOH in the future.

Table 10 summarizes the advantages and disadvantages of the two BAT options available to purveyors.

Table 10
Assembly Testing Options

	Testing of Assemblies	
	By Purveyor-Employed BAT (on Staff or Contract)	***By Customer-Employed BAT (i.e., Contractor)***
Major Advantages	Ensures quality assurance/control of test results for the purveyor. Reduces the administrative costs for the purveyor. Results in good public relations for utility. Decreases customer costs.	Cost is borne by the customers with cross connections.
Major Disadvantages	Increases staff/consultant costs for the purveyor. Increases staff training requirements for the purveyor	Testing quality assurance/control is not ensured. Increased administrative costs for the purveyor.

Purveyors can use the following table to document the policy decision made regarding assembly testing.

Decision -- Testing of Assemblies (check one)	
	By purveyor's BAT (on staff or contractor)
	By customer-employed BAT (contractor)

6.2.9 Cost Recovery

The purveyor is required by WAC 246-290-490 to develop and implement a CCC program. The cost of the program should be identified in the purveyor's operating budget. To reduce and/or recover the cost of the CCC program, the purveyor may:

1. Assess the general administrative cost of the cross-connection program to all customers, or to one class of customers (e.g., all commercial customers) through use of:

    a. Commodity or consumption charges (e.g., $/gallon);

    b. Meter charges (e.g., $/month), based on the size of meter; or

    c. A supplemental backflow assembly charge (e.g., $/month), based on the size of assembly.

2. Require each customer to directly bear the costs of the hazard surveys and costs associated with the purchase, installation, testing, and maintenance of any backflow assemblies by requiring each customer:

    a. With a commercial account, to hire a CCS to conduct the initial and subsequent surveys to assess the health hazard;

    b. To purchase, install, maintain, repair, and/or replace any backflow assemblies required as a result of the hazard survey; and

    c. With backflow assemblies to hire a BAT for assembly testing.

The advantages and disadvantages of these options are summarized in Table 11.

Table 11
Recovery of Program Cost Options

	Recovery of Program Costs		
	Borne by All Customers (general water rates)	***Assessed to Specific Class of Customers (commercial meters)***	***Each Customer Directly Bears Cost***
Major Advantages	No special billing procedures necessary. No special billing expenses.	More equitable than general water rates.	Most equitable cost recovery approach.
Major Disadvantages	Subsidizes services posing cross-connection hazard. Least equitable approach.	Requires special billing procedures and increases billing expenses. Needs rate analysis for each separate class of customer.	Increases billing complexity and expenses.

The purveyor can use the following table to select the desired method of recovering costs for implementation of the CCC program.

Decision - Program Cost Recovery (check one)	
	Costs borne by all customers (through general water rates)
	Costs assessed to a specific class of customers (e.g., commercial)
	Each customer with a cross-connection hazard directly bears cost

Table 12 identifies all the major policy decisions that need to be made by purveyors:

- Just starting to develop their CCC programs; or
- That are updating their existing programs to comply with the latest revisions to WAC 246-290-490.

Purveyors can use Table 12 to document (in summary form) all their CCC program policy decisions. Note: Table 12 highlights suggested policy options for small utilities serving mostly single-family residential connections.

Table 12
Summary of Purveyor's Program Decisions

Check at least one for each program decision item.

Program Decision Item	Decision
1. Type of Program [General, WAC 246-290-490(2)(e)]	
a. *Premises Isolation Only **	
b. Premises Isolation and In-premises protection (Combination Program)	
2. Extent of Coordination with Local Administrative Authority [WAC 246-290-490(2)(d)]	
a. *Information Exchange **	
b. Interaction	
c. Combined/Joint Program	
3. Relationship with Customer [WAC 246-290-490(3)(b), Element 1]	
a. *Signed service agreement or contract **	
b. Ordinance/Resolution; implied service agreement	
4. Enforcement of Corrective Action [WAC 246-290-490(3)(b), Element 1]	
a. Rely upon shut-off of water service	
b. *Rely upon purveyor installed premises isolation **	
5. Hazard Assessment/Reassessment [WAC 246-290-490(3)(c), Element 2]	
a. *By purveyor's CCS on staff or equivalent **	
b. By customer-employed CCS, with report reviewed by purveyor's CCS	
6. Premises Isolation Assembly Ownership/Location [WAC 246-290-490(3)(d), Element 3]	
a. *On purveyor's service line **	
b. On customer's service line	
7. CCS Program Manager Option [WAC 246-290-490(3)(e), Element 4]	
a. Purveyor's staff member certified	
b. Use another agency's CCS by inter-agency agreement to	
c. *Contract with consultant CCS **	
8. Testing of Assemblies [WAC 246-290-490(3)(f), Element 5]	
a. *By purveyor's BAT (staff or contractor) **	
b. By customer-employed BAT (contractor)	
9. Cost Recovery [WAC 246-290-100(4)(h) and –105(4)(p)]	
a. *Borne by all customers (general water rates) **	
b. Assessed to specific class (commercial meters)	
c. Each customer directly bears cost	

*****Suggested options for small utilities serving mostly single-family residences.

6.3 Programs for Non-Community Systems

Per Chapter 246-290 WAC, there are two types of Group A non-community water systems. These are:

1. Non-transient non-community systems; and

2. Transient non-community systems.

The WAC defines these types of systems as follows:

1. A ***non-transient non-community system (NTNC)*** is a public water system that provides service opportunity to 25 or more of the same nonresidential people for one hundred eighty or more days within a calendar year (e.g., school, motel with more than 25 employees on site); and

2. **A *transient non-community system (TNC)*** is a public water system that serves:

    a. 25 or more different people each day for sixty or more days within a calendar year;

    b. 25 or more of the same people each day for sixty or more days, but less than one hundred eighty days, within a calendar year; or

    c. One thousand or more people for two or more consecutive days within a calendar year (e.g., county fair).

A common characteristic of many non-community systems is that they occupy a single parcel of land under one ownership. As such, the public water system includes all facilities from the source of supply to the tap.

For non-community systems, the jurisdictions of DOH and the Local Administrative Authority overlap. Thus, the owner of a non-community system must comply with the requirements of both jurisdictions. In other words, non-community systems must comply with both the drinking water regulations (Chapter 246-290 WAC) and the Uniform Plumbing Code. Where there is a conflict between requirements, the system owner must comply with the more stringent of the two requirements, or comply with both requirements.

Non-community system purveyors that are developing CCC programs should apply the drinking water system regulations to those facilities that are normally operated by a community water system. In other words, the drinking water regulations should be applied to the infrastructure from the source of supply to the service connection to the building(s). The primary focus of the drinking water regulations is that the source of supply and the distribution facilities (transmission mains) are not contaminated via unprotected cross connections.

Similarly, the Uniform Plumbing Code should be applied to the fixtures within the building(s) and any irrigation systems on the premises. The primary focus of the Uniform Plumbing Code is to ensure that the plumbing system (within the building or buildings) doesn't become contaminated via unprotected cross connections.

Depending on the number and type of buildings served, the CCC policy of a non-community system may be to provide:

1. Source protection, if a single building or water user is supplied (e.g., provide a DCVA at the well house that supplies a restaurant);

2. Area or building isolation (particularly if a Table 9 of WAC 246-290-490 premises is served); and/or

3. Equivalent in-building protection through installation of backflow preventers at hazardous fixtures per the Uniform Plumbing Code.

An example of a written program plan for a non-community system is provided in Appendix B.

Chapter 7. Implementing a Cross-Connection Control Program

7.1 General Administration

The general administration tasks for a CCC program are the same for both small and larger public water systems. The primary difference is in the amount of administrative work associated with implementation of the program. For small water systems with primarily residential customers, the administration of a CCC program should only result in a small, added workload to the system's existing workload. For these systems, someone other than a DOH-certified CCS may carry out many of the administrative tasks associated with the CCC program. .

7.1.1 Overall Management

WAC 246-290-490(3)(e) states that "personnel, including at least one person certified as a cross-connection specialist (CCS)..." shall be provided to develop and implement the CCC program. The WAC also states in 246-290-490(2)(c) that the purveyor may implement the CCC program ***directly or by means of a contract*** with another agency or party acceptable to DOH. This language was specifically included to give small water systems that serve primarily residential customers the option to contract out for the services of a CCS. Options for employing the CCS were discussed in Section 6.2.6.

The purveyor should designate one individual, i.e., the CCC Program Manager, to provide the overall management of the CCC program. The purveyor should delegate to the Program Manager the authority and responsibility to organize and implement the CCC program. For larger systems, the CCC Program Manager is typically the DOH-certified CCS in responsible charge of the CCC program.

Small water system CCC Program Managers must have a general knowledge of cross-connection control, but they do not necessarily need to be certified as CCSs. For small systems, administration of the CCC program typically requires only limited, periodic work for the CCS. Thus, the services of a full-time CCS are not likely to be needed by a small water system (nor is full-time involvement always practical).

Small water system CCC Program Managers that are not currently certified CCSs should complete some CCC training. This will help them to become more knowledgeable about the public health aspects of cross-connection control, the regulatory requirements for public water systems and basic industry practices. This knowledge should help uncertified Program Managers with the day-to-day implementation of the CCC program.

Several third party training organizations offer CCC courses in Washington. These courses range from inexpensive one-day Basic CCC classes for Small Water Systems to more expensive, weeklong CCS certification classes. More information is available on training in Appendix F.

Small system CCC Program Managers interested in pursuing CCS certification should note that scholarships might be available. The CCC Committee of the PNWS-AWWA offers CCS scholarships for systems serving 2500 connections or less. See Appendix F for further information.

For a small water system, the CCC Program Manager may be:

- The owner of the system (private system);
- An elected representative (water association or district); or
- An employee, contract manager, or satellite management agency.

The Cross-Connection Control Program Manager will be responsible for the day-to-day contact with customers, the general public, state and local government, etc., on cross-connection control matters. To ensure that this contact person is kept well informed, all CCC Program administration tasks should be under their supervision. For example:

- All correspondence should be routed through the Program Manager (the Program Manager should sign the correspondence or at least receive a copy); and
- All plans, plan review reports, cross-connection hazard survey reports, assembly test reports, etc., should be routed through the Program Manager.

When technical CCC program issues arise, small water system CCC Program Managers who are not certified CCSs should defer to the recommendations and advice of the contract CCS. Program Managers who have concerns about or don't agree with the contract CCS's recommendations can contact DOH for regulatory interpretation questions and/or seek the advice of another experienced CCS. ***Non-CCS Program Managers should not over-ride the recommendations of their contract CCSs.***

7.1.2 Purveyor's Policy Statement/Ordinance

Once developed, the CCC program policy (policy statement, ordinance and/or resolution) should be incorporated into the purveyor's system Management and Operations Manual. Purveyors can inform their customers about the CCC program policy by:

- Distributing the policy to ***new*** customers with the application for water service (e.g., as an attachment to the service agreement); and
- Including a policy summary statement in the annual Consumer Confidence Report.

The annual Consumer Confidence Report can be a cost-effective tool for public education on the purveyor's conditions for service, including the customer's obligation to protect the distribution system from contamination through cross connections.

7.1.3 Personnel

All water system employees (staff and/or contract manager/operator) should have a general knowledge of cross-connection control. The CCS involved in the development and implementation of the program will likely be the most knowledgeable about the principles and practices of cross-connection control. However, all other water system staff members, from time-to-time, may be involved in CCC issues because:

- Customers may ask general questions of office and/or field staff;
- Office staff will process the paper work related to the CCC program (survey records, correspondence, DOH annual summary report forms, etc.);
- Field staff may encounter backflow conditions (e.g., main break causes backsiphonage conditions, meter reader may notice meter running backwards) or may need to respond to a backflow incident; and
- Field staff may spot a new "uncontrolled" (i.e., no backflow preventer) cross connection (e.g., customer may have installed a lawn sprinkler system without notifying the purveyor or obtaining a plumbing permit from the Local Administrative Authority).

General CCC training for staff may be obtained through:

1. Workshops sponsored and/or provided by DOH or technical associations, such as the Pacific Northwest Section - American Water Works Association (PNWS-AWWA), Spokane Region Cross-Connection Control Committee (SRC4), the Western Washington Cross-Connection Prevention Professionals Group (The Group), and the American Backflow Prevention Association (ABPA); and
2. Operator training manuals, such as *Small Water System Operation and Maintenance*, prepared by California State University, Sacramento.

For the CCS employed by the purveyor (on staff or by contract), specialized training is recommended and current CCS certification is required. The initial specialized training may be a three to five day "specialist" course. The CCS must hold a current Cross-Connection Specialist certification issued by DOH. To be eligible to sit for the CCS exam, an applicant must have a high school diploma and have six months experience (not necessarily in cross-connection control) working for a public water system. The Cross-Connection Control Resource Information section in Appendix F provides information about training resources and CCS certification courses.

DOH requires contract operators to be certified CCSs and Water Distribution Managers. To obtain a list of contract operators check the DOH Office of Drinking Water website at: http://www.doh.wa.gov/ehp/dw

Completion of a three to five-day CCS course and certification by DOH ensures a minimum level of knowledge in cross-connection control. However, CCS certification does not provide any assurance of experience or expertise. **When employing a CCS to develop and/or implement the cross-connection control program (either on staff, inter-agency agreement, or contract CCS), purveyors should follow procedures normally used for selecting a contractor or consultant.** Purveyors should try to get proposals from at least two (preferably three) contract CCSs**.**

When soliciting proposals from contract CCSs, at a minimum, purveyors should request:

- Documentation of current CCS certification, and the date of initial CCS certification;
- A resume of applicable training, certification, and work experience with specific emphasis on experience in program development and implementation to meet the most recently published CCC regulations;
- A list of public water systems the CCS is currently under contract with and/or systems they have provided CCC program services to within the past five years and a description of the services provided to each system;
- The names of at least three public water systems the CCS has worked for within the previous three to five years (to contact as references);
- Information on the scope of services the CCS is willing to provide (the scope should include all tasks specified in WAC 246-290-490); and
- A sample of the CCS's written work, i.e., a sample CCC program plan, Annual Summary Report (ASR), other report, etc. (to evaluate the quality of their work).

Purveyors should carefully check references to obtain information about the quality of service provided by the contract cross-connection control specialist. When checking references purveyors should be sure to ask whether any problems were encountered during the contract and whether the system would hire the CCS again. ***Purveyors should avoid cross-connection control specialists who advocate an in-premises protection only strategy, since this approach doesn't provide adequate public health protection and doesn't comply with the current cross-connection control regulations.***

It is recommended that purveyors only hire CCSs who:

- Are familiar with the intent of the most recently published CCC regulations and any revisions being proposed and who work closely with DOH CCC program staff;
- Develop *complete* written program plans (i.e., that comply with all the minimum elements in the regulations);
- Return purveyor technical assistance phone calls within a reasonable timeframe and during business hours; and
- Ensure that *original* CCC records are kept by the water system.

If the feedback from references is positive, purveyors may wish to request a sample contract from the CCS. The contract should clearly identify the specific tasks to be performed by the CCS, the timeframe for completion of each task and include a provision for the water system to seek a remedy for any work that is unsatisfactory to the purveyor (at no additional cost). The contract should also specify that the written program plan will comply with the requirements of the most recently published CCC regulations. In addition, the contract should specify that all work performed by the CCS will be in accordance with the most recently published CCC regulations.

Small systems contracting out the development of a written program are advised to include language in the contract that allows them to withhold final payment pending DOH's review and acceptance of the written program. Final payment should not be made, until DOH has indicated to the purveyor that the written CCC program meets the current regulatory requirements and is considered acceptable.

Taking the above steps is analogous to an insurance policy for a small system and should help prevent a small system from being taken advantage of by unscrupulous CCSs. DOH is aware of one small system in Washington that paid $15,000 to a contract CCS for development of a written CCC program plan and other services. Shortly after the system made the final payment, DOH sent out notices that the new regulations had been adopted. The program developed for the small system didn't begin to comply with the new regulations. The contract only specified that the program would meet the regulations currently in effect, so the system had no recourse.

In this case, the CCS under contract never told the purveyor that the CCC regulations were undergoing extensive revision. Yet, DOH had notified all CCSs in Washington of the upcoming

changes and invited them to participate in the regulation revisions process. The CCS also did not inform the purveyor that the new regulations specified the minimum elements of a written program. *If, prior to making final payment, the small system purveyor had contacted DOH and asked for an informal review of the program developed by the contract CCS, this unfortunate situation might have been avoided.*

Small water systems might want to consider contracting with a cross-connection control specialist who also is a certified backflow assembly tester (i.e., BAT). Although not required, the additional certification would be advantageous to the system, since the BAT could test all purveyor-owned assemblies.

For most small systems, a cross-connection control specialist (CCS) is needed for a relatively small number of hours of work. Thus, the hourly fee should not be a major factor in selecting a CCS. **Instead, purveyors should select a CCS based upon training, experience, and past performance.**

WAC 246-290-490 specifies a number of program tasks that must be performed by a DOH-certified CCS. These tasks include:

1. Development and implementation of the CCC program;

2. Hazard assessments and determination of the appropriate backflow protection;

3. Granting of exceptions to the mandatory premises isolation requirements and completion of forms to document the reason for granting the exception;

4. Inspection of backflow preventer installations to ensure that backflow protection provided is commensurate with the degree of hazard;

5. Inspection of AG installations for compliance with the AG definition; and

6. Inspection of backflow assemblies for correct installation and approval status.

Although not currently required, it is recommended that the purveyor's CCS also complete and sign the ASR forms. For small water systems with a CCS under contract, if completion of the forms is not within the scope of work provided by the CCS, at a minimum the CCS should:

- Provide the CCC Program Manager with the information and inventory data needed to complete the ASR forms;
- Review the forms for accuracy; and
- Sign them on behalf of the water system.

Table 13 provides an example of the typical tasks and division of responsibilities between the Program Manager and the CCS for a small water system.

Table 13
Example of Cross-Connection Control Program Task Assignments
Small Water System Program

Cross-Connection Control Program Task	Cross-Connection Control Program Manager (or Other PWS Staff)	Cross-Connection Control Specialist
Development of policy and resolution (i.e., cross-connection control written program plan)	√	√
Execution of service agreement	√	
Conduct general risk assessment (by category of premises)	√	
Conduct customer-specific risk assessment	√	√[+]
Determine appropriate backflow protection	√	√
Grant exception to mandatory premises isolation		√
Schedule "mandatory" premises isolation backflow preventer installations	√	
Schedule other backflow preventer installations	√	
Coordinate with Local Administrative Authority	√	
Conduct general plan review (by category of premises)	√	
Conduct customer-specific plan review	√	√
Maintain cross-connection control program records	√	√
Notify customers of need for annual backflow preventer test and maintenance	√	
Review test reports	√	√
Complete Annual Summary Reports		√[*]
Testing quality assurance review	√	
Public education program	√	
Hazard survey for compliance with service agreement	√	√
Enforcement of service agreement	√	√
Response to backflow incident	√	√

[+]If the purveyor's CCS does not conduct a risk assessment, the CCS should review the general assessment made by the Program Manager or the specific assessment made by the customer-employed CCS and reported to the purveyor.

[*]As an alternative, the CCS may provide assistance to the Program Manager for completion of the forms and then review and sign the Annual Summary Report forms on behalf of the system.

7.1.4 Water Service Agreements

The types of water service agreements and their respective benefits are discussed in Section 6.2.2. Whatever the form of service agreement, the Program Manager and CCS should be involved in the:

- Development of the water service agreement; and
- Administration of the agreement (e.g., enforcement actions).

For new customers, the Program Manager should ensure that the customer signs an application for water service (i.e., the service agreement).

For existing customers, two options are available. The Program Manager may either:

1. Request that the customer sign an agreement; or
2. Reaffirm the terms of service by asking the customer to sign an agreement as a condition of retaining his existing backflow prevention assemblies for fixture protection in lieu of installing premises isolation assemblies.

Appendix D includes copies of standard service agreements for new and existing customers.

7.1.5 Backflow Assembly Installation Standards

Per WAC 246-290-490, all backflow prevention assemblies that protect the public water system from contamination must be approved by DOH. In addition, the WAC requires these assemblies to be installed in a manner that will facilitate their proper operation, maintenance, inspection, and in-line testing. Assemblies must also be installed in compliance with safety regulations and all applicable building and plumbing code regulations.

The purveyor is responsible for ensuring that backflow preventer installations comply with safety regulations, codes, etc., for the backflow preventers it owns.

These requirements were established, because an improper installation decreases the assembly's reliability of preventing backflow. This is due to the fact that:

- An unsafe or inaccessible location reduces the likelihood of an assembly being inspected, tested and maintained;

- Improper assembly orientation may prevent proper operation;
- Installation in a hazardous environment may allow contaminants to enter the assembly through test cocks, relief valve ports, or air inlets, and/or may cause corrosion damage; and
- Freezing temperatures or high temperatures may damage the assembly.

Where the purveyor is also part of a Local Administrative Authority (town or city), any installation problem noted by the purveyor (i.e., water utility) is deemed to be known by the plumbing inspector, whether or not there is communication between the two departments.

Manufacturers provide recommendations for the proper installation of their assemblies, and it is important to consult the manufacturer's instructions prior to the installation of any assembly. However, the water purveyor or other approval authorities may have established installation requirements that differ from the manufacturer's recommendations. In fact, the manufacturer's recommendations may be in conflict with DOH and/or the purveyor's requirements. ***In all cases, the more stringent installation requirements of DOH and the water purveyor take precedence over the manufacturer's recommendations.***

The Washington State Department of Health Backflow Prevention Assemblies Approved for Installation in Washington shows the approved orientation for the installation of each approved assembly (e.g., flow upward, horizontal, vertical, or alternate orientation) by make, model, and size of assembly.

Systems that need to establish installation standards for their program plans can consult technical publications, regional CCC groups and/or larger purveyors in their area for detailed assembly installation information. Recommended installation standards are provided in technical publications such as the:

- *Manual of Cross-Connection Control*, published by the University of Southern California - Foundation for Cross-Connection Control & Hydraulic Research (USC-FCCCHR); and

- *Cross-Connection Control Manual, Accepted Procedure and Practice*, published by the Pacific Northwest Section, American Water Works Association.

Most water utilities in Washington with established programs reference the PNWS-AWWA publication.

Another source of installation information is the regional CCC groups within Washington. The Western Washington Group has developed brochures showing the installation requirements for each type of assembly used for premises isolation.

The purveyor of a small water system may adopt installation standards by referencing:

- The above noted manuals;
- The standard plans issued by a nearby (large) utility;
- The standard plans issued by a regional CCC group in Washington; or
- Standard plans issued by the purveyor.

Examples of standard installation drawings are included in Appendix D.

7.2 Implementation of Program

Program implementation starts with the adoption of CCC policy (ordinance, by-law, or other legal instrument). This is followed by development of a written program plan to carry out the policy and to meet the requirements of WAC 246-290-490. The written description of the program must be included in the purveyor's Water System Plan or Small Water System Management Program, whichever is applicable.

WAC 246-290-490 (3)(b) sets forth the required elements of the CCC program. The minimum elements are summarized in section 4.3 of this manual. The major implementation elements are discussed in this section.

The purveyor reduces exposure to liability by complying with the cross-connection control regulations for Group A systems and following the "standards" of the cross-connection control industry.

7.2.1 Schedule of Initial Risk Assessment

The purveyor must establish procedures and schedules for assessing the cross-connection hazard (health risk) of all new and existing customers. The procedure for hazard assessment depends on the type of program adopted, i.e., premises isolation versus a combination program that also relies on in-premises assemblies. The discussion on program types was provided in Section 6.2.1.

New Customers

The hazard assessment for all new connections should have begun in April of 1999. This was the effective date of the new regulations. According to the WAC, f**or new customers, the hazard assessment must be done *before service is provided*.** The assessment may be done by:

- Category classification (medical clinic);
- Customer questionnaire (fire sprinkler system); and/or
- CCS plan review and field cross-connection hazard survey.

Existing Customers

For existing customers, the purveyor must prepare a schedule acceptable to DOH for:

- The initial hazard assessment; and
- Periodic re-assessment.

An absolute deadline has not been established by DOH for completion of the initial hazard assessment.

The hazard assessment ***procedures*** for new and existing customers are essentially the same. However, the hazard assessment ***schedules*** for these two categories of customers will differ. The hazard assessment schedule for existing customers is a key element in the purveyor's written program.

The assessment schedules directly affect the annual administration and operation costs of the purveyor's CCC program. The schedules also have a major bearing on the purveyor's exposure to the risk of contamination and potential liability for damages from a backflow incident.

Hazard assessments should be done on a priority basis. A higher priority should be given to high health hazard categories of premises (e.g., hospitals, medical clinics, car washes, etc., of the type listed on Table 9 of WAC 246-290-490).

Setting Priorities

All purveyors need to set priorities for hazard assessments, due to limited resources. However, purveyors with combination programs need to even be more careful in prioritizing their hazard assessments. This is because a significantly greater effort is required to survey the non-high hazard customer's premises to determine if backflow preventers at fixtures provide protection commensurate with the degree of hazard and equivalent to premises isolation.

For combination programs that rely on premises isolation and in-premises protection, priority for hazard assessments should be as follows (listed from high to low priority):

1. High Priority: Customers of the type listed on Table 9 of WAC 246-290-490 as a high health hazard requiring premises isolation by an AG or RPBA (mandatory premises isolation);

2. Medium Priority: Customers included in the purveyor's supplemental list for mandatory premises isolation; and

3. Low Priority: The remaining customers.

Initial Hazard Assessment Schedule

Table 14 lays out a reasonable hazard assessment schedule for a small water system. The timeframes listed under the schedule column start from the initiation of the water system's CCC program.

Table 14
Hazard Assessment Schedule

Hazard Assessment Task	Schedule from Cross-Connection Control Program Start-Up
Establish policy	Within 6 months
Identify high hazard facilities (Table 9 of WAC 246-290-490) for mandatory premises isolation	Within 9 months
Identify supplemental facilities for premises isolation (e.g., all commercial customers)	Within 12 months
Identify residential customers with "special plumbing or activities" on their property	Within 15 months

Purveyor may use their billing records, business license information, and/or the telephone book "Yellow Pages" to identify potential commercial, industrial, and other non-single family residential customers. This list can be used to make a rough appraisal of the number of connections in each non-residential hazard category. For small towns and cities, the local business licensing agency is often a very good source of information for identifying non-residential customers.

Once the rough appraisal is made, the next step is to determine if a customer actually "fits" the hazard category**. The purveyor's CCS must make final hazard assessment decisions.**

Exceptions

As mentioned previously, some customers that initially appear to fall into a high health hazard category requiring mandatory premises isolation may actually pose only a moderate or low hazard to the public water system. For example, a building described as a medical clinic may contain only psychologists, and thus, would not fall into a high health hazard category requiring premises isolation by an RPBA. However, if a tenant changed to a physician or veterinarian, the building would require an RPBA for premises isolation.

Other examples of premises that initially appear to fall into the high hazard category but pose a lower hazard are:

- A "bottling plant" that only stores the finished product; and

- A commercial dry cleaners or laundromat that is used only to collect or deliver clothes (i.e., the cleaning facility is located elsewhere).

For these type facilities, the purveyor has the policy choice to either:

1. Require premises isolation from the start, based on the potential for a change in tenants/use; or

2. Grant an exception to premises isolation and frequently re-assess the hazard to detect a change in tenants/use.

Purveyors don't have to obtain DOH concurrence to grant an exception to mandatory premises isolation for a high-hazard category of customer of the type listed in Table 9 of WAC 246-290-490, where the customer's water use does not "match" the high-hazard assessment. However, the purveyor's CCS must document the justification for waiving premises isolation by completing an Exceptions Report Form. Purveyors must submit Exception Report Forms to DOH with the ASR (see Section 7.6). All exceptions granted by the purveyor to the mandatory premises isolation list must be reported to DOH.

Customer Notification

Once the initial hazard assessment is complete, purveyors must notify their customers of the results. The WAC states that the purveyor must notify the customer, within a reasonable timeframe, to inform them of the assessment results and the requirements for backflow prevention to protect the purveyor's system. To allow for purveyor flexibility, DOH has not established an absolute timeframe for issuing the assessment notification for backflow preventer installation.

However, to better protect public health and for risk and liability management, it is prudent for purveyors to notify customers as soon as possible of their:

- Hazard assessment results; and

- Responsibility to prevent contaminants from entering their potable water systems *and* the purveyor's distribution system.

Table 15 presents a schedule that can be used by a small water system for notifying customers of hazard assessment results. The schedule starts from the date of completion of the hazard assessment.

Table 15
Hazard Notification Schedule

Hazard Notification Category	Schedule from Completion of Hazard Assessment*
Customers assessed as a high health hazard (Table 9 of WAC 246-290-490 facilities)	Within 3 months
Customers assessed as requiring premises isolation (supplemental to Table 9 of WAC 246-290-490 facilities)	Within 6 months
All other customers where purveyor chooses to rely upon in-premises backflow assemblies	Within 6 months

* This schedule is considered to meet the "reasonable time frame" requirements of the WAC.

Under Washington Law, it is a gross misdemeanor for any owner or operator to knowingly permit, or by omission allow, the contamination of a water system (see Section 5.3 for RCW wording).

7.2.2 Schedule for Periodic Re-Assessment

Per the WAC, the purveyor must periodically re-assess the cross-connection hazard posed by ***all*** connections served by the system. **However, the purveyor's reassessment efforts can focus on customers *other* than those with *premises isolation AGs or RPBAs*, as long as annual test reports are satisfactory for the premises isolation backflow preventers.** Customers with premises isolation AGs or RPBAs already have installed the maximum backflow protection**.**

How often should hazard reassessments be done? The frequency of periodic hazard re-assessments should be based on the potential risk the customer poses to the purveyor's water system.

Due to resource limitations, most systems will need to phase the scheduling of hazard re-assessments. Customers that pose the greatest risk to the water system (i.e., non-residential customers) should have their hazard reassessments scheduled first. Once the higher risk customers have been addressed, assessments for lower risk (i.e., residential) customers can be scheduled. Priorities (listed from highest to lowest) for scheduling re-assessments should be given to:

1. Non-residential customers:

    a. ***Without*** premises isolation DCVAs, i.e., where in-premises backflow preventers protect the public water system from contamination (e.g., industrial building that is likely to have changes in the plumbing);

    b. ***With*** premises isolation DCVAs, where changes in tenants or plumbing could raise the risk to high hazard (e.g., strip malls where a building occupancy could change to include a medical clinic); and

2. Residential customers (the water use questionnaire can be used for re-assessments).

Per the WAC, a re-assessment is also required whenever there is a change in the use of the premises. This is because a change in use often results in a change in the hazard posed to the water system. Hazard assessment changes may trigger:

- A requirement for a premises isolation backflow preventer, where no preventer was previously required or where the purveyor relied on in-premises preventers; or

- An upgrade to a more reliable preventer (i.e., DCVA to RPBA), where a less reliable preventer was previously required.

Table 16 lays out a reasonable hazard re-assessment schedule for a small water system. The schedule starts from the date of the initial hazard assessment.

Table 16
Hazard Re-Assessment Schedule

Hazard Re-Assessment Task	Schedule
Customers assessed as a high health hazard (Table 9 of WAC 246-290-490 facilities) and protected by a premises isolation AG or RPBA	Not required as long as annual test results are satisfactory
Customers assessed as requiring premises isolation (supplemental to Table 9 of WAC 246-290-490 facilities)	Within 2 years if DCVA installed
Customers where in-premises backflow assemblies are relied upon by purveyor	Within 2 years
All residential customers where purveyor relies upon compliance with Uniform Plumbing Code	Within 2-3 years (questionnaire)

7.2.3 Schedule for Backflow Prevention Assemblies Installation

Once the initial hazard assessment is complete and the customer has been notified, the WAC states that the purveyor shall develop and implement procedures for:

- Eliminating cross connections; or
- Controlling cross connections by installation of approved backflow preventers commensurate with the degree of hazard in situations where cross connections cannot be eliminated.

Cross connections are eliminated by removal of points of use of water (e.g., plumbing fixtures) or removing sources of contaminants (e.g., abandoning a private well according to Washington State Department of Ecology specifications).

It is not possible to eliminate all cross connections on the customer's premises.

A hazard assessment determines if the customer's cross connections are "controlled" to the satisfaction of the purveyor. If control is not satisfactory, the purveyor must:

1. Install an approved backflow preventer for premises isolation;
2. Get the customer to install an approved backflow preventer for premises isolation; or
3. Get the customer to install in-premises approved backflow preventers (for fixture protection or area isolation) that provide equivalent (to premises isolation) protection for the purveyor's system.

Whichever is the case, the purveyor must establish a schedule for the installation of the backflow preventer(s). To give flexibility to purveyors, DOH has not established an absolute deadline for the installation of backflow preventers once a hazard assessment for an existing customer has been done. ***However, for public health protection and liability management reasons, backflow preventers should be installed as soon as possible after the need for a preventer is identified.***

For liability management reasons, it is in the purveyor's best interest to have assemblies installed as soon as possible.

The installation of backflow prevention assemblies may be a significant cost to the purveyor and/or customer. ***For new customers***, the cost of a backflow preventer for premises isolation or in-premises alternatives will constitute a very small amount compared with the overall project budget if they are required at the time of construction. Thus, the requirement for the installation of a BPA *before service is provided* is not an undue burden to the customer.

For existing customers and/or the purveyor, the cost of installing backflow preventers as a retrofit may be significant compared with the customer's annual operating budget. Except where an immediate high health hazard has been identified, it is reasonable to work with the customer and to allow them enough time to fund the installation of backflow prevention assemblies required by the purveyor.

Table 17 provides a schedule that lays out "a reasonable timeframe" for an existing customer of a small water system to install a backflow assembly or assemblies. The timeframes presented start from the date the customer was notified of the hazard assessment.

Table 17
Backflow Preventer Installation Schedule for Existing Customers

Backflow Preventer Installation Category (*Existing Customers Only*)	**Schedule (from Notice of Hazard Assessment)**
Customers assessed as a high health hazard (Table 9 of WAC 246-290-490 facilities) where premises isolation is mandated by Washington State Department of Health	Within 90 days but no longer than two years*
Customers assessed as requiring premises isolation (purveyor's supplemental list to Table 9 of WAC 246-290-490 facilities)	Within 90 days but no longer than two years*
Customers where in-premises backflow assemblies are relied upon by purveyor	Within four years
All residential customers with special plumbing or hazardous activities on their property	Within 10 years

* Schedules longer than 90 days are subject to acceptance by the Purveyor.

The 90-day schedule should apply if the customer:

- Applies for an additional or relocated water service;
- Makes a change in the use of water (e.g., changes from a residential to commercial classification); or
- Makes significant modifications to his premises (e.g., major building addition, remodel, etc).

Table 18 is an example summary task schedule that should be included in the purveyor's written CCC program plan.

Table 18
Example Summary Task Schedule to Include in Written Cross-Connection Control Program Plan

Task	Planned Implementation (Starting from Policy Adoption Date)
Assess purveyor's water system facility hazards	Within 30 days
Install backflow preventers on purveyor's system facility hazards	Within 6 months
Conduct hazard assessment for ***new*** customers	Upon application for service
Ensure backflow preventers are installed for ***new*** customers	Before service is provided
Conduct hazard assessments for ***existing*** **high hazard** customers	Within 6 months
Notify ***existing*** **high hazard** customers of hazard assessment results and backflow preventer installation requirements	Within 9 months
Ensure backflow preventers are installed for ***existing*** **high hazard** customers	Within 12 months*
Conduct hazard assessments for ***existing,*** **non-high hazard**, commercial customers	Within 12 months
Notify ***existing*** **non-high hazard** commercial customers of hazard assessment results and backflow preventer installation requirements	Within 18 months
Ensure backflow preventers are installed on connections to ***existing,*** **non-high hazard, commercial** customers	Within 36-48 months*
Re-assess non-high hazard commercial customers	Every 2 years
Conduct hazard assessment for **existing** residential customers	Within 12 months
Notify residential customers of hazard assessment results and backflow preventer installation requirements	Within 18 months
Ensure that backflow preventers are installed on residential connections that require protection	Within 36-48 months*
Re-assess residential customers	Every 2 years

* Earlier BPA installation is required when a customer's water use changes (e.g., tenant changes), and/or building modifications require a plumbing permit.

7.2.4 Communication with Customers

The CCC Program Manager should be responsible for all *initial* communication with customers. The initial communication should include:

- Notification of the water system's policy (or change in policy) to establish a CCC program;
- Public education materials describing the need for cross-connection control; and
- Hazard assessment information, i.e., either the distribution of water use questionnaires or the scheduling of a cross-connection hazard survey.

The purveyor's CCS may handle subsequent communication with customers regarding the CCC program.

Sample letters, public education materials, and forms are provided in Appendix D. Additional resource materials may be found in the PNWS-AWWA manuals and USC Manual listed in Appendix F.

7.2.5 Requirements of Existing Customers

Under WAC 246-290-490, purveyors must protect the public water system from the cross-connection hazards posed by its customers. Unless the purveyor has specific knowledge to the contrary, for existing customers, the purveyor must assume that:

- All customers were in compliance with the plumbing code in effect at the time the certificate of occupancy was issued for their premises; and
- No significant plumbing changes have occurred (i.e., that would require a new plumbing permit) since the certificate was issued.

The Local Administrative Authority, i.e., plumbing inspector, has jurisdiction over matters of public health and safety within the property lines of the customer's premises. The customer's plumbing is considered to be "reasonably" safe, if it complies with the health-related parts of the Uniform Plumbing Code. However, unlike the drinking water regulations, the customer is "vested" with respect to the Uniform Plumbing Code.

Thus, Local Administrative Authorities can't require a change in the customer's plumbing system to bring the plumbing into compliance with the most recently adopted code, unless the Local Administrative Authority has specific knowledge of a health or safety hazard. Also, the Local Administrative Authority doesn't have the authority to make random plumbing inspections, once certificates of occupancy have been issued.

Despite efforts by the Local Administrative Authorities to ensure compliance with the Uniform Plumbing Code, experience has shown that some customers make plumbing changes without the proper permits and thus, their plumbing doesn't comply with the plumbing code in effect at the time of construction. Also, the plumbing of many other existing customer premises may not comply with the most recently adopted plumbing code.

If the purveyor requires a backflow preventer for premises isolation (i.e., purveyor installs or requires customer to install), prior to installation:

1. The purveyor should notify the customer:

    a. Of the reason for the backflow preventer installation (e.g., general policy for a meter check; to isolate an existing lawn irrigation system); and

    b. That the backflow preventer will prevent thermal expansion from being relieved through the distribution main, and thus, the customer should ensure that his plumbing has adequate safety protection (e.g., pressure temperature relief valve on the hot water tank, and an expansion tank).

2. The purveyor should notify the Local Administrative Authority (LAA) (plumbing inspector) of any backflow preventer and/or meter check to be installed by the purveyor, so that the LAA may inspect the customer's premises for thermal expansion protection.

7.2.6 Cross Connections in Purveyor's System

An essential component of the purveyor's CCC program is to provide protection from cross connections at purveyor-owned facilities. These facilities include:

- Office and maintenance buildings;
- Water treatment plants; and
- Water distribution mains.

Office and maintenance facilities should be evaluated using the same criteria used for assessing a customer's premises. For facilities constructed on parcels of land owned by the purveyor, the purveyor must also comply with the Uniform Plumbing Code requirements enforced by the Local Administrative Authority (plumbing inspector).

If the purveyor is an agency of a city, town, or county, municipal facilities such as water and sewage treatment plants, parks, community centers, government buildings, and shops must also be evaluated for cross-connection control.

There are a number of common cross connections typically found in purveyor-owned facilities. These may include cross connections in:

1. Water treatment plant including:
    a. The discharge of filter backwash and rinse water to waste;
    b. Potable water connections to chemical injectors or pumps;
    c. Sampling lines that connect a meter to both raw and treated (finished) water;
    d. By-pass connections between raw and treated water storage;
    e. Surface washers;
    f. Hydraulically operated filter effluent valves;
    g. Chlorinators connected to both raw and treated water; and
    h. Common walls between finished and unfinished water.
2. Distribution system including:
    a. Air release and vacuum valves;
    b. Temporary connections for new water main disinfection;
    c. Fire hydrants, standpipes when used for:
        i. Filling tanker trucks; or
        ii. Flushing water mains or sewers.

The following manuals list typical distribution system hazards and the recommended backflow prevention:

- *Cross-Connection Control Manual, Accepted Procedure and Practice*, published by the Pacific Northwest Section, American Water Works Association (PNWS-AWWA); and
- *Manual of Cross*-Connection Control, published by the University of Southern California Foundation for Cross-Connection Control and Hydraulic Research.

For liability and public relations reasons, it is prudent for purveyors to provide cross-connection control for all purveyor-owned facilities, ***before*** asking customers to spend money for backflow preventer installation and testing.

7.2.7 Common Cross Connections Associated with Small Water Systems

Small water systems often serve many premises (and water uses) that pose cross-connection hazards to the public water system. Some of these hazards are listed on Table 9 of WAC 246-290-490(4). However, other specific hazards encountered in the system may not be listed.

Many large water systems have developed extensive lists of hazardous premises they serve and identify the required backflow protection. Tables 19 and 20 list some hazards that may be served by small water systems and the required/recommended backflow protection for each type of hazard or premises. For ease of use, the tables are divided into ***residential*** and ***commercial*** hazards respectively.

Table 19
Required/Recommended Protection for Residential Hazards*

Description of Hazard or Premises	Minimum Protection Required/Recommended
Auxiliary water supply, interconnected with public water system	RPBA (premises isolation, required as per Table 9)
Auxiliary water supply, not interconnected with public water system	DCVA (premises isolation)
Boiler	RPBA on boiler feed line (or for premises isolation)
Commercial farms	RPBA (premises isolation as per Table 9)
Decorative ponds	AVB at hose connection
Dialysis equipment	RPBA
Hobby farms (5 - 10 acres, non-commercial)	DCVA (premises isolation)
Home-based businesses (e.g., beauty salon, woodworking shop) where water use is essentially the same as for normal residential uses	AVB on hose bibbs
Hydroponics, non-commercial greenhouse	RPBA (for premises isolation)
Livestock watering trough	AG or AVB
Irrigation system (buried underground)	DCVA
Photo lab, darkroom (non-commercial)	DCVA (for premises isolation)
Private Boat Moorage	AVB at hose connection
Soaker hoses	AVB at hose connection
Solar heating system, heat exchangers (with chemicals)	RPBA (for premises isolation)
Solar heating system, heat exchangers (no chemicals used)	DCVA (for premises isolation)
Swimming pool, spa - filled manually by hose	AVB at hose connection
Swimming pool, spa - fill line *with an* approved AG plumbed in	No additional protection
Swimming Pool, spa - fill line plumbed in below water level (i.e., *no* AG)	RPBA on fill line
Water softeners with discharge to sewer (through AG)	RPBA
Sewage Pumps, Lift Stations, Grinder Pumps	AG or RPBA

* Note: "Table 9" in this table refers to Table 9 of WAC 246-290-490(4).

Table 20
Required/Recommended Protection for Commercial-Type Hazards *

Description of Hazard or Premises	Minimum Protection Required/Recommended
All Commercial Connections	DCVA (premises isolation) minimum
Strip malls	DCVA (premises isolation)
Farms	RPBA (Table 9)
Fish farms	RPBA (Table 9)
High schools with laboratories (no internal RPBA for area isolation)	RPBA (Table 9)
High schools with laboratories (with internal RPBA for area isolation)	DCVA (premises isolation)
Elementary schools	DCVA (premises isolation)
Dry cleaners	RPBA (Table 9)
Photo labs, film processors (Commercial)	RPBA (Table 9)
Hydroponics, greenhouses (Commercial)	RPBA or DCVA
Home-based businesses on commercial scale	DCVA minimum

* Note: "Table 9" in this table refers to Table 9 of WAC 246-290-490(4).

7.3 Mandatory Premises Isolation

WAC 246-290-490 lists categories of high hazard premises that require mandatory isolation. Most CCC technical publications also list customers requiring mandatory premises isolation. These lists were developed based on assessments of severe or very high degrees of hazard. The assessments are often confirmed by reports of well-documented backflow incidents.

Between the various technical publications and state regulations, there may be different customer categories listed for mandatory premises isolation. **At a minimum, the purveyor must comply with the premises isolation requirements of WAC 246-290-490(4).** It should be noted that the WAC gives purveyors the option to require premises isolation for connections serving premises not identified on Table 9 of WAC 246-290-490. These include premises such as tall buildings, premises with complex plumbing or plumbing subject to frequent changes, and premises with a history of cross connections being established.

Some purveyors supplement Table 9 of the WAC by adding other customer categories (usually non-residential) to their system's mandatory premises isolation list. Purveyors can obtain ideas for additional categories in technical manuals, such as:

- *Manual of Cross-Connection Control*, published by the University of Southern California - Foundation for Cross-Connection Control & Hydraulic Research (USC-FCCCHR); and

- *Cross-Connection Control Manual, Accepted Procedure and Practice*, published by the Pacific Northwest Section - American Water Works Association.

7.3.1 Washington State Requirements for Fire Protection Systems

In Washington, the Uniform Plumbing Code requires backflow prevention for all fire protection systems, except for flow-through or combination systems for residential services.

A ***flow-through fire system***:

- Uses a different piping system from the consumer's potable water piping;
- Is constructed of approved potable water piping and materials to which sprinkler heads are attached; and
- Ends at a connection to a toilet or other plumbing fixture to prevent the water in the pipe from becoming stagnant.

In a ***combination fire system***, the potable water piping and materials serve both the fire sprinkler system and the consumer's potable water system.

WAC 246-290-490 requires the purveyor to ensure that backflow protection consistent with the UPC is installed. The UPC requires minimum protection as follows:

- An RPBA or RPDA for fire protection systems with chemical addition or using an unapproved auxiliary water supply; and
- A DCVA or DCDA for all other fire protection systems.

Purveyors can easily meet this requirement for ***new*** services. Purveyors can stipulate in the service agreement (i.e., application for new service) that the customer must comply with the current Uniform Plumbing Code before service is provided.

For ***existing*** customers, the purveyors may only request compliance from the customer, or install a backflow preventer on the service for premises isolation. By defining "high health cross-connection hazard" and specifying the appropriate approved backflow preventer as an AG, RPBA or RPDA, by default, a fire protection system requiring a DCVA or DCDA is a "low health cross-connection hazard." This may undermine the purveyor's enforcement of a DCVA for public health protection reasons.

For ***existing*** customers, purveyors can require compliance in situations where the customer has a change in water use, remodels the premises, etc.

The purveyor is not an enforcement agency for the Uniform Plumbing Code.

An existing customer may be "vested" with respect to the Uniform Plumbing Code. If a backflow preventer is not currently in place, neither the purveyor nor the Local Administrative Authority (plumbing inspector) has authority to require compliance with the current UPC.

However, if the customer does not install the required backflow prevention assembly, the purveyor must install an assembly on the service.

Table 21 provides guidance for scheduling the installation of backflow preventers on fire sprinkler systems for existing customer connections. The schedule starts from the purveyor's hazard assessment notice to the customers.

Table 21
Backflow Prevention for Fire Sprinkler Systems on Existing Customer Connections

Fire System Hazard Category	**Schedule of Backflow Preventer Installation**
High health hazard fire systems (with chemical addition and/or auxiliary supply)	Within 2 years
All other fire systems	Within 10 years

The purveyor should notify the Local Fire Marshal whenever a backflow preventer is installed on a fire service or on a combined fire and domestic service, since the added pressure loss through the backflow assembly may affect the design of the fire system.

7.3.2 Purveyor's Additional Requirements

WAC 246-290-490 establishes minimum requirements for CCC programs. However, under the WAC, water purveyors may develop more stringent program requirements than those of the state and/or local levels of government (i.e., the county).

When adding new requirements or making more stringent requirements, it is important for purveyors to:

- Establish justification for the added requirement (i.e., show that the decision was not arbitrary or capricious and that the added requirement can reasonably be met by the customer); and

- Maintain consistency in their application to customers served by the system.

Justification for additional requirements may be based on:

- Following good engineering and public health practice as outlined in technical publications; and

- Adopting a policy to further limit the purveyor's risk and liability (e.g., by requiring DCVAs on all commercial customers).

Consistency may require that the purveyor apply the more stringent requirements:

- Equally to new and existing customers; and

- To similar hazard categories.

7.4 Requirements for Backflow Assembly Testing

Backflow assemblies are mechanical devices subject to fouling and wear. History has shown that backflow preventers that are not tested periodically will not be maintained or repaired. Backflow preventers that are not maintained or repaired have a much higher likelihood of failure. Similarly, AGs that are not inspected periodically may be by-passed or re-plumbed.

Testing Frequency

Backflow assemblies and AGs used in place of assemblies relied upon by the purveyor to protect the public water system must be inspected for proper installation and tested for proper operation. WAC 246-290-490 (7)(b) requires inspections and/or testing:

1. At the time of installation;

2. Annually after installation (minimum frequency);

3. After a backflow incident; and

4. After an assembly is repaired, reinstalled, or relocated (or an AG is re-plumbed).

Atmospheric vacuum breakers on residential lawn irrigation systems, if relied upon by the purveyor to protect the public water system, must also be inspected for proper installation per WAC 246-290-490 (7)(c):

- At the time of installation;
- After a backflow incident; and
- After repair, reinstallation or relocation.

Because a test procedure for the AVB has not been established, some purveyors require a PVBA or DCVA on all lawn irrigation systems, so that all preventers relied upon by the purveyor are testable.

A lawn irrigation system for a residential customer poses no less a hazard than an irrigation system for a commercial customer.

The UPC establishes backflow protection requirements for irrigation systems, and as amended for Washington, allows an RPBA, PVBA, DCVA, or an AVB for backflow protection for irrigation system without chemical addition.

Test Procedures

WAC 246-290-490 requires backflow prevention assemblies (relied upon by the purveyor to protect the public water system) to be tested using procedures acceptable to DOH, such as those specified in the most recently published edition of the *Manual of Cross-Connection Control*, published by the University of Southern California Foundation for Cross-Connection Control & Hydraulic Research. Copies of the field test procedures are available from DOH on request.

It should be noted that the testing requirements in the most recently published edition of the *Cross-Connection Control Manual, Accepted Procedure and Practice*, published by the Pacific

Northwest Section, American Water Works Association are more stringent (supplemental tests required) than the test procedures specified by USC. Therefore, it is important that the purveyor adopts as a policy and notifies the customer if the more stringent PNWS-AWWA test requirements are to be followed. An example of the supplemental testing requirements of the PNWS-AWWA Manual for RPBAs is that the RPBA relief valve tests include a check to verify the relief valve will continue to open and discharge water.

Most small water systems specify the use of the standard Washington State Department of Health Approved Field Test Procedures.

As discussed in Section 6.2.7, purveyors have the option of testing the assembly (purveyor's certified staff or purveyor-contracted certified BAT), or requiring the customer to employ a BAT to perform the test and submit a test report to the purveyor. The purveyor may also elect to make the initial test of an assembly, but require the customer to arrange for all subsequent tests.

Testing Notification

Regardless whether the purveyor or assembly owner is responsible for testing, the small water system purveyor should schedule the tests of all assemblies that protect the public water system at the same time of the year. This approach makes it easier for the purveyor to administer the testing portion of the cross-connection program. In addition, BATs will often reduce their testing fees when they can arrange to test several assemblies in one area.

If the assembly owner is responsible for testing, purveyors should:

1. Notify the customer in writing and allow at least one month from the date of notification for the testing to be done and the test report to be returned;

2. Include, in the testing notification letter, a statement affirming the understanding that service is provided based on the customer's agreement to test, maintain, and repair the assemblies required by the purveyor (if a written service agreement is not in place);

3. Specify the acceptable field testing method (e.g., the DOH field test procedures);

4. Provide a list of local testers (BATs); and

5. Provide a test report form for each assembly owned by the customer.

A public listing of the DOH-certified BATs will be available from DOH sometime in the future.

DOH does not currently require that one "standardized" test report form be used in Washington. This approach gives purveyors the flexibility to design their test report forms for ease of data entry into their respective CCC databases. However, all test reports should provide the same basic information needed by the purveyor. It is hoped that the minimum elements of an acceptable test report form will be addressed in future CCC-related regulation revisions.

Because the minimum elements of an acceptable test report are not currently specified in the drinking water regulations, purveyors must identify test report contents as part of their testing quality assurance/quality control program (Element 6 of WAC 246-290-490). A sample test report form is included in Appendix D. Other sample test report forms are available:

- In technical CCC guidance manuals from PNWS-AWWA and/or USC;
- From national organizations such as the ABPA; and
- From regional CCC groups in Washington, such as SRC4 and "The Group."
- To obtain test report forms from the above sources, see Appendix F for contact information.
- It should be noted that the regional CCC groups in Washington are in the process of developing a standardized test report form for voluntary use by their members. Many BATs support the standardized test report form concept since it eliminates the need for BATs to keep track of and use different test report forms in different service areas (i.e., a different form for each purveyor).

Purveyors may choose to address the requirement for a periodic hazard re-assessment at the same time they address assembly testing. For purveyors that conduct their own hazard re-assessments, a water use questionnaire can be included with the testing notice for customers. Purveyors that rely on hazard re-assessments conducted by customer-employed CCSs may include with the assembly testing notice:

- A notification letter for the customer to employ a certified CCS to re-survey the premises (the CCS's re-assessment should either confirm that the existing assemblies are commensurate with the degree of hazard or recommend additional and/or different assemblies); and
- A list of local CCSs providing contract services.

A list of contract operators who are certified CCSs is available from the DOH website. Regional CCC groups may also maintain lists of experienced CCSs who are willing to contract with small water system customers for hazard surveys. See Appendix F for resource information.
It should be noted that the purveyor only has a contract relationship with the customer. In other words, purveyors have no contract relationship with the customer's BAT or CCS. ***Thus, all***

purveyor communication about testing and surveys should be with the customer, not with the customer's backflow assembly tester or cross-connection control specialist (third party). Purveyors should send the notices for testing directly to their customers. Both the BAT and the customer should sign the completed test report form, and the customer should return the completed form to the purveyor. This approach accomplishes the following:

- Establishes a record that the customer was made aware of any deficiencies listed in the report form by the BAT; and

- Re-affirms, by signature, the customer's agreement to test and maintain the assemblies as a condition of service.

Copies of sample testing notification and hazard re-survey letters are included in Appendix D.

The CCC Program Manager should review test and survey forms as soon as possible after they are submitted. For CCC Program Managers that are not certified CCSs, the purveyor's CCS should provide guidance on what to look for in the initial review (e.g., the test form is complete, and the data shows that the assembly passed the test). Based on the initial review:

- If the test report form is incomplete, the CCC Program Manager should notify the customer of the deficiency (and may, as a courtesy, choose to also notify the BAT at the same time);

- If the test report form shows that the assembly failed the field test, the CCC Program Manager should give written notice to the customer to repair or replace the assembly within a specified timeframe (e.g., one month). This is the start of enforcement procedures.

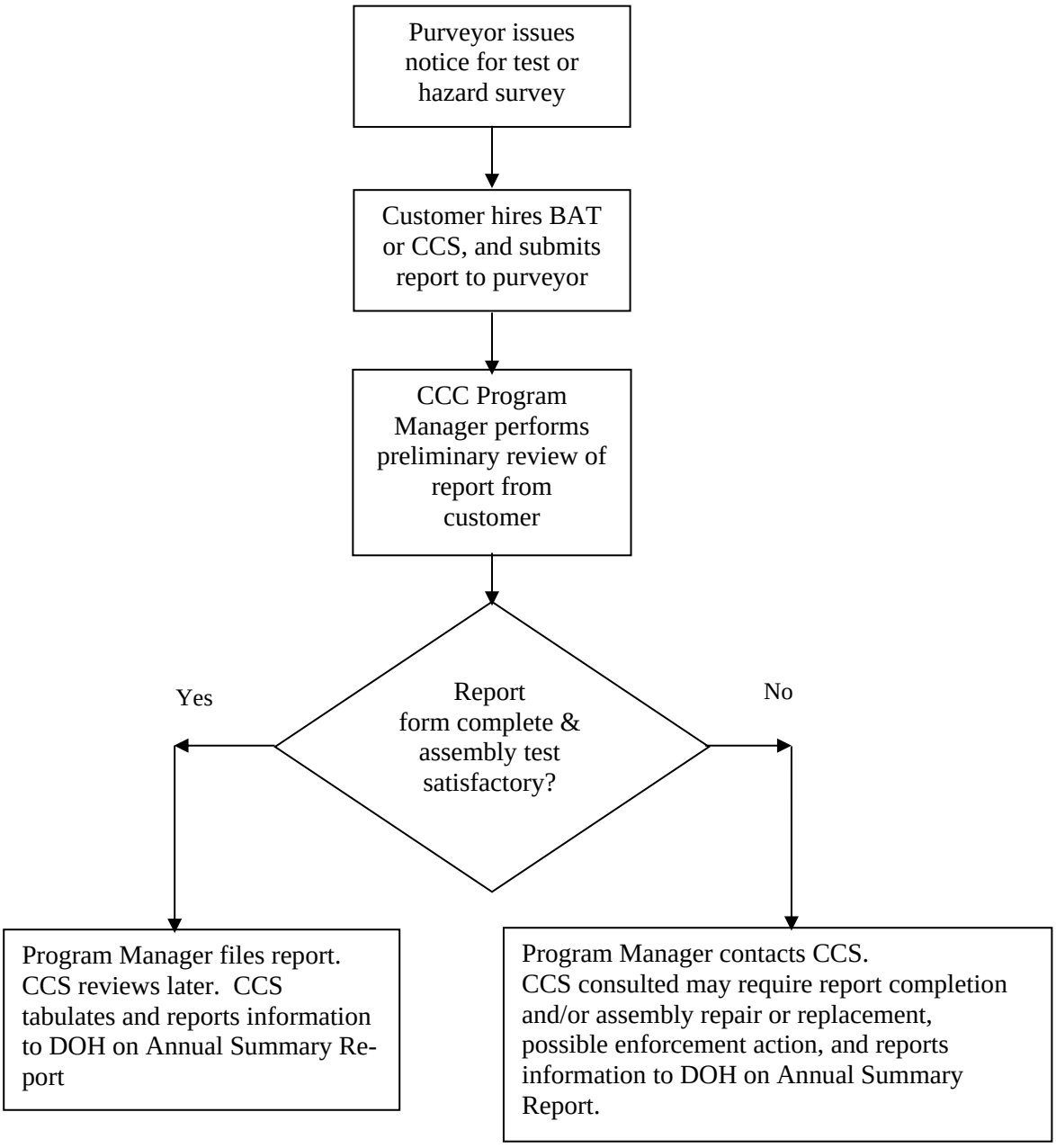
If the CCC Program Manager has concerns about a test report, the contract CCS should be contacted for technical assistance.

Figure 4 shows a typical testing process for a small public water system.

If the purveyor's cross-connection control program relies upon third party backflow assembly tester or cross-connection control specialist for hazard surveys, the purveyor has a contract relationship with the owner, not with the owner's cross-connection control specialist or backflow assembly tester.

All purveyor communication for surveys and tests should only be with the building/assembly owner.

Figure 4
Annual Testing of Assemblies



Purveyors should consider coordinating their test notices with the test notices issued by the Local Administrative Authority (LAA). Coordination of test notices will benefit the purveyor's customers. The customer may have assemblies within his premises that are not relied upon by the purveyor for the protection of the distribution system. The cost for testing may be reduced, if the customer arranges to have all assemblies on the property (premises isolation and fixture protection) tested at one time. Also, where purveyors rely on in-premises assemblies to protect the public water system, the annual test reports required by the purveyor may be used to show compliance with the Uniform Plumbing Code.

When coordinating test notices with the test notices issued by the LAA, the purveyor's testing letter to the customer should clearly state that the:

- Customer is to return test reports to the purveyor only for the assemblies specified;
- Other assemblies owned by the customer should be tested to comply with the Uniform Plumbing Code; and
- If applicable, test reports submitted to the purveyor may also be used to comply with the Uniform Plumbing Code testing requirements.

For combined programs (see Section 6.2.2), the coordination may include a provision for the purveyor to collect test report forms for all assemblies within the property lines of the customer's premises.

Regardless of the level of coordination with the LAA, the purveyor may receive completed test reports for assemblies not on the purveyor's list (i.e., not relied upon by the purveyor to protect the public water system. For many purveyors it is preferable for the purveyor just to return the reports to the customer, rather than take on the responsibility for forwarding them to the appropriate Local Administrative Authority. This is especially true for purveyors who coordinate with many LAAs. When returning the report forms to customers, the purveyor should advise the customer of the correct LAA to mail the form to.

Sample notification letters are provided in Appendix D. Additional samples of letter and forms may be found in referenced publications listed in Appendix F.

7.4.1 Approved Backflow Assembly Testers

A DOH-certified backflow assembly tester (BAT) must conduct all field tests of assemblies relied upon by the purveyor to protect the water system. The public listing of certified testers should be available from the DOH Office of Drinking Water website in the future. The website address is: http://www.doh.wa.gov/ehp/dw

Purveyors should maintain a list of local certified assembly testers, so that the CCC Program Manager:

- Can verify the tester's certification status when checking completed test reports; and
- May provide the list to customers along with the testing notice.

In addition to DOH BAT certification, purveyors may specify additional conditions that must be met by BATs who want to provide testing in the purveyor's service area. These conditions may specify that the BAT must:

- Also be certified as a CCS;
- Have a local business license;
- Be a registered contractor (issued by Washington State Department of Labor and Industries [L&I]); and
- Use purveyor-approved testing equipment and show proof of a recent verification of test equipment accuracy and calibration (if needed).

The Local Administrative Authority may also enforce minimum qualifications for BATs. The Uniform Plumbing Code amendments in Washington require assemblies to be tested by a DOH-certified BAT (See WAC 51-46-0603.3.2).

WAC 246-290-490 and the Uniform Plumbing Code (amended for Washington) both require DOH BAT certification. However, purveyors need to be aware that additional certifications and/or registrations may be required for persons providing backflow assembly installation, maintenance and/or repair services. As mentioned in Chapter 3, RCW 18.106 (enforced by L&I) establishes minimum standards for persons installing, repairing, and/or replacing backflow prevention assemblies within buildings.

Under this RCW, only licensed plumbers can install, maintain, repair, and/or replace backflow assemblies *within* buildings. BATs who also hold a specialty plumber certification from L&I may test and repair assemblies within buildings. In addition, RCW 18.27 establishes the requirements for contractor registration, and some BATs may be required to also be registered contractors. Thus, multiple statutes/regulations may apply to persons working on assemblies in the purveyor's service area, depending on where the assemblies are located (within building vs. outside a building), and whether services in addition to testing are provided. Purveyors must check on the certification status of BATs to comply with WAC 246-290-490. However, L&I does not expect purveyors to "police" or enforce contractor registration and/or plumber certification requirements.

Current DOH tester certification is limited to demonstrating a minimum level of knowledge in assembly field test procedures and installation requirements. BAT certification doesn't certify that an individual can properly install and/or repair an assembly. BATs who hold the specialty plumber

certification issued by L&I have successfully passed a written exam on assembly repair, in addition to the BAT written and hands-on exam.

7.4.2 Quality Assurance Program

WAC 246-290-490 requires purveyors to develop a testing quality assurance/quality control program. This program must:

- Document that test reports are submitted by DOH-certified testers;
- Document the type of test kit used, serial number, and that the test kit has been verified for accuracy within the last year and calibrated if necessary (some test kits can't be re-calibrated),
- Specify the minimum content of test reports (to be acceptable to the purveyor) and establish procedures for test report review; and
- Establish a timeframe for completed test reports to be submitted to the purveyor (e.g., within 10 working days from the date the test was performed).

Most large purveyors maintain much of this tester quality assurance information in their CCC Program databases. Program Managers that have this tester information readily available can more effectively and efficiently administer their CCC programs. For example, some systems enter the certification numbers of testers into their CCC databases, so that any test reports submitted by non-certified testers will automatically be rejected.

To comply with the quality assurance/quality control requirement, purveyors of small systems may rely upon information provided by another nearby utility (i.e., larger) that has an established quality assurance program. This could include proof of test kit accuracy verification and calibration and the list of approved testers.

Although small water system CCC Program Managers may conduct the initial reviews of test reports for completeness, they may not have the training to assess the details in the report. The test report details may show that:

- An assembly is wearing out and needs to be repaired or replaced; and
- The BAT improperly tested the assembly or falsified the test results.

The purveyor's CCS (either on staff or contract) should have the training and experience to review test reports for quality assurance purposes. The reviews should be made at least annually, and preferably more often, if previous reviews show problems (e.g., questionable BAT performance).

The purveyor's cross-connection control specialist
should report any questionable
backflow assembly tester performance
to Washington State Department of Health
Operator Certification Program.

7.5 Enforcement Procedures

When the purveyor provides good public education material on cross-connection control to customers, 99 percent of the customers will voluntarily comply with the purveyor's requirements. For the other one percent, from the very start of the CCC program, the purveyor should anticipate the need to take some form of corrective or enforcement action against non-complying customers.

Purveyors should be pro-active and establish their enforcement policies *before* any enforcement action is required. The purveyor's management staff and lawyer should be involved in establishing the enforcement policy. The policy lays out in detail the enforcement procedures to be followed by the CCC Program Manager.

The purveyor's enforcement procedures should address the following:

- The number of subsequent notices to be sent (after the initial notice), before the purveyor takes an enforcement action;
- The time interval between notices;
- Use of registered mail for subsequent notices;
- The wording of notices (e.g., polite reminder for the second notice, and an ultimatum for the final notice);
- For in-premises assemblies, when to inform the Local Administrative Authority of the problem;
- When to notify the purveyor's management, and/or lawyer;

- An appeal process; and

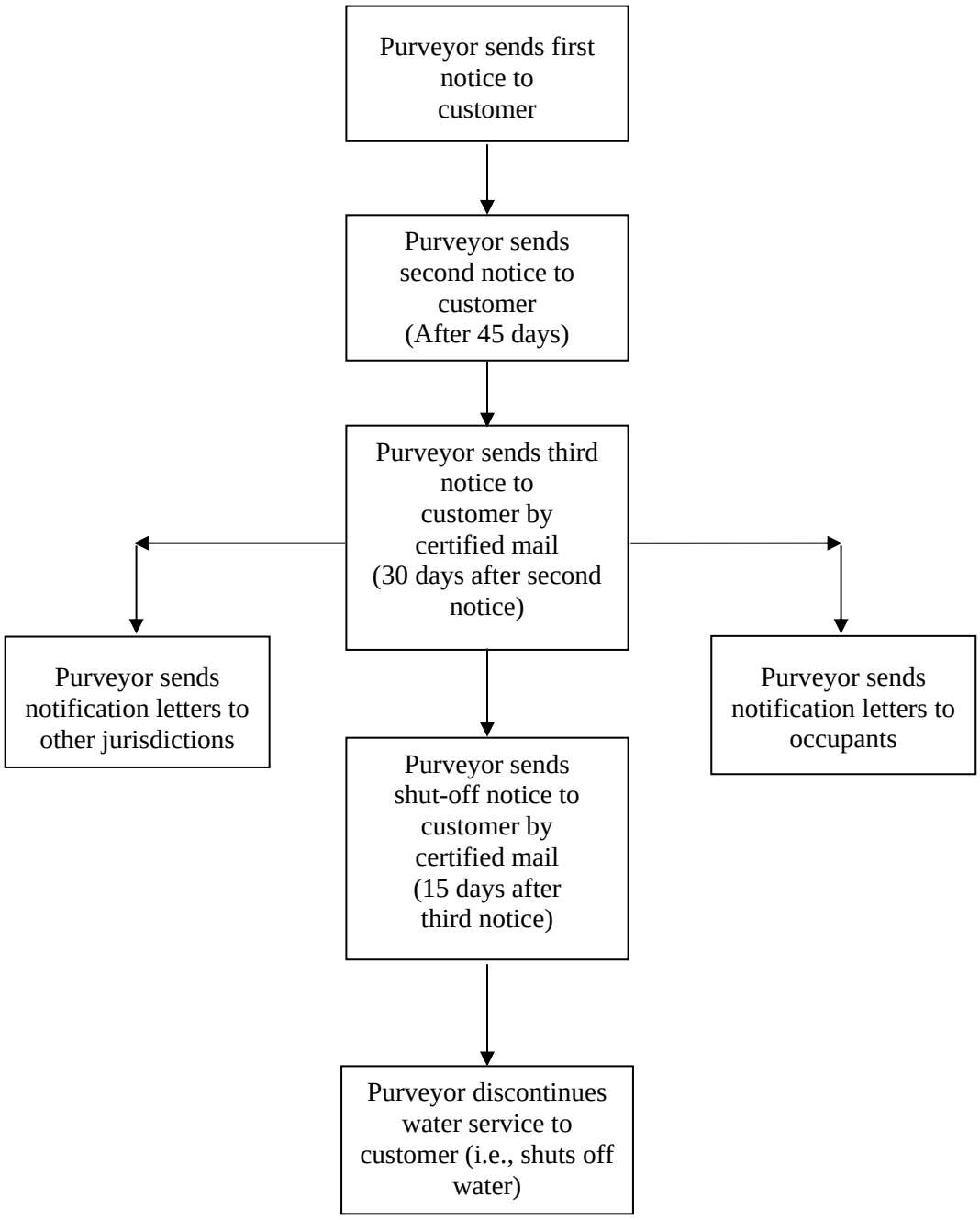
- Which enforcement procedure to take for the various assessed "degrees of hazard."

Figure 5 shows an example enforcement procedure. Examples of enforcement notices are included in Appendix D.

Purveyors need to be aware that the failure of an assembly to pass the initial or annual field test doesn't establish for certain that the assembly will fail to prevent backflow. Failure may only indicate that the desired level of reliability is not present. Thus, when laying out enforcement procedures, purveyors should make the enforcement action appropriate for the hazard posed. DOH has developed guidance regarding when purveyors should shut-off water and when they should use other enforcement tools to protect the public water supply.

Shutting off the supply of water to a customer may cause a health hazard and/or a financial loss. Purveyors should have enforcement tools other than water shut-off also available, such as installing or testing the backflow preventer and billing the customer.

Figure 5
Enforcement Procedures



7.6 Record-Keeping and Reporting Requirements

Purveyors should keep all original records (correspondence, plans, etc.) in the water system's files. If contractors (i.e., CCSs) are used, the contractors should give the original records to the water system and retain photocopies of the records in their own files.

If a contract cross-connection control specialist
or manager's employment ceases,
the purveyor may have difficulty recovering files
and records that are retained at any location other
than the purveyor's office files.

Original records should always be kept in the water system's files.

7.6.1 Record of Risk Assessment

For each customer, the purveyor shall maintain a record of the initial risk assessment and subsequent re-assessments, in the form of a completed:

- Water Use Questionnaire (i.e., for residential customers); and/or
- Cross-Connection Survey Report.

Samples of each may be found in Appendix D, Sample Forms.

For risk management reasons, the purveyor should retain both the initial form, plus the latest re-assessment, because the forms:

- Document that the purveyor has complied with the DOH requirement to evaluate new and existing customers to assess the degree of hazard;
- Provide a historical perspective that may be needed by a new CCS, Program Manager, or supervisor;
- Contain a signed statement from the customer or customer's CCS about his water use, and/or assessed degree of hazard; and
- Contain information useful for investigating a backflow incident.

For each connection where the purveyor requires a backflow preventer to protect the public water system, records should be kept indicating the assessed hazard level of the connection and the required backflow preventer.

7.6.2 Inventory of Backflow Preventers

It is critical for purveyors to keep accurate records on backflow preventers that protect the public water system from contamination. These may include both *purveyor-owned* assemblies and *customer-owned* assemblies.

WAC 246-290-490 (3)(j)(ii) lists the minimum backflow preventer inventory information that purveyors must keep on file. For each customer where an approved BPA or AG is required by the purveyor to protect its distribution system, and for approved backflow preventers installed at purveyor- owned facilities, the inventory should include {per WAC 246-290-490(3), Element 9}:

- Information on the exact location of the backflow preventer or AG (adequate details to find the backflow preventers);
- Description of hazard isolated (either the category of premises such as a medical clinic or the fixture such as a boiler);
- Type, size, make, model, serial number and installation date of backflow assembly, or AG details including installation date; and
- Size, make, model and installation date of AVBs used on irrigation systems.

7.6.3 Inventory of Backflow Preventer Test/Inspection Reports

For each assembly field test or AG inspection, the test report inventory information should include at a minimum:

- The name and certification number of the BAT performing each test or inspection;
- Test results (pass/fail and actual readings) or inspection results; and
- Repair/re-plumbing history.

Appendix D contains a sample file record form that includes the inventory of backflow preventers and test reports.

7.6.4 Correspondence

The purveyor should maintain copies of all correspondence with customers for a period of at least five years. The purveyor should also maintain, *as a permanent record*, the:

- Most current service agreement with each customer; and
- Notification to the customer to install a backflow preventer(s) to protect the public water system from contamination.

All correspondence with DOH and the Local Administrative Authority should be maintained for at least five years.

7.6.5 Washington State Department of Health Reporting Requirements

Purveyors are required to meet the reporting requirements of WAC 246-290-490. These requirements include completing the CCC Annual Summary Report (ASR) forms and making them available to DOH on request.

Copies of the current forms (there are three) are available from DOH. However, DOH will send purveyors the forms and ask them to submit to DOH information on their CCC programs. These forms comprise the ASR forms. The forms provide a means for purveyors to report on the:

- Status of their written program plans;
- Progress of their implementation activities; and
- Exceptions they have granted and the justifications for granting of the exemptions.

An example set of ASR forms for 2002 is provided in Appendix E.

7.6.6 Spreadsheets and Computer Database Software

For the number of assemblies expected in most small water systems, the records of the inventory of assemblies, test reports, local BATs, etc., can be kept on a spreadsheet, either manually (i.e., on paper), or using commercially available computer software (such as Excel or Access).

Proprietary computer database software programs are also available. These have been developed specifically to aid purveyors in the management of their CCC programs. A list of some of the companies supplying computer software for managing CCC programs is provided in Appendix F. Regardless of the type of record-keeping system used, the system must be able to provide the data to answer the questions that appear on the CCC ASR forms.

7.6.7 Backflow Incident Reports

Element 9 of WAC 246-290-490 requires purveyors to maintain CCC records and complete annual summary reports and backflow incident reports. Backflow incidents are to be reported on a form acceptable to DOH. A sample backflow incident report form developed by the PNWS-AWWA CCC Committee is provided in Appendix D. Additional supporting information, photos, laboratory analyses, etc., may be attached to the report.

The PNWS-AWWA form is currently acceptable to DOH. In the future, DOH may develop a Backflow Incident Report Form that is designed for computer entry and future web-based submission.

If a backflow incident occurs, check with DOH to ensure that your system has the most current form to report the details of the incident.

7.7 Public Education

Public education is a key part of the purveyor's CCC program. Through public education programs, purveyors inform customers of:

- The public health impacts of potential cross-connection hazards;
- Their responsibility to protect the public water system from contamination;
- The purveyor's requirement to comply with the DOH regulations; and
- The purveyor's policies (i.e., conditions of service).

7.7.1 Type of Effort

Element 8 of WAC 246-290-490 requires purveyors to educate their customers on cross-connection control. For small water systems, the recommended public education methods are:

- Water bill inserts (brochures);
- Consumer Confidence Reports;
- For new customers, information on service policy distributed with application for service; and
- Reliance on general public education materials developed by regional and national technical groups (PNWS-AWWA CCC Committee, SRC4, The Group, and other technical organizations) and/or by large utilities.

Appendix F lists organizations that have public education brochures available for use by small water systems. Due to limited resources, small water systems are encouraged to use the education materials (brochures, postcards, newsletters, etc.) already developed by other organizations and/or systems. There is no need for a small water system to "re-invent the wheel," when so many excellent public education materials on cross-connection control are readily available.

7.7.2 Frequency

The *annual* Consumer Confidence Report provides an excellent means for purveyors to routinely inform their customers about the status of their CCC programs. The purveyor's Consumer Confidence Report should include a brief statement about the:

- Purveyor's operation of a CCC program; and
- Customer's responsibility to protect his/her plumbing system and the purveyor's distribution system from contamination via cross connections.

Education brochures should be distributed every two to three years.

7.8 Backflow Incident Response Plan

A purveyor's failure to properly respond to a backflow incident may:

- Significantly increase the number of persons exposed to a health hazard;
- Increase the purveyor's effort (cost) to contain a contaminant and clean the contaminant from the distribution system; and
- Expose the purveyor to increased liability from a claim for punitive damages for negligence.

Don't wait until a backflow incident occurs to develop an incident response plan!

Appendix C contains a sample Backflow Incident Response Plan for a small water system.

Purveyors should consult with the Local Administrative Authorities and Local Health jurisdiction when developing the response plan to identify communication lines, responsibilities, etc.

7.9 Special Requirements for Reclaimed or Greywater

Reclaimed Water

Reclaimed water systems use wastewater treatment effluent that has been adequately and reliably treated, so that it is suitable for a direct beneficial use or a controlled use that would not otherwise occur. The utilization of reclaimed water is referred to as **water reuse**.

A **dual distribution system** supplies two grades of water to the same service area. One of the supplies is potable water (acceptable for drinking), and the other supply is non-potable (not acceptable for drinking). Reclaimed wastewater is typically categorized into four classes of quality (A through D). The classes range from the highest quality (A) for use in irrigation of open access areas (golf courses, parks, schoolyard), non-restricted recreational impoundments, toilet flushing in commercial and industrial buildings, and fire protection systems to the lowest quality (D) for use in irrigation of non-food crops (e.g., tree farms) and sewer flushing.

All classes of reclaimed water shall be considered a high health hazard. This is because the degree of treatment of reclaimed water is far less than the minimum requirements for the production of potable water. Even the Class A reclaimed water criteria allow water that could contain pathogens (disease-causing organisms).

Due to the high health hazard, Department of Ecology standards prohibit direct connections between reclaimed water systems and potable water systems. Further details can be found in the Water Reclamation and Reuse Standards jointly published by the Department of Ecology and Washington State Department of Health (Ecology publication number 97-23).

For connections where both reclaimed water and potable water are provided on the customer's premises, per Table 9 of WAC 246-290-490, premises isolation at the water meter by an approved AG or reduced-pressure backflow assembly is required. The requirement is based on the assessment of a high health hazard of the reclaimed water, and the high probability that a connection could be made between the potable and non-potable systems (e.g., in the event of the disruption of the reclaimed water supply). Dual distribution systems operated by the water utility shall adhere to the requirement for premises isolation.

Where the customer uses potable water to supplement a reclaimed water system, the water must be supplied through an approved AG inspected by a certified BAT at least annually.

Greywater

A **greywater system** uses the effluent from untreated household wastewater that hasn't come into contact with toilet waste or food processing waste. Greywater includes wastewater from bathtubs, showers, bathroom sinks, clothes washing machines and laundry tubs. Greywater excludes wastewater from kitchen sinks and dishwashers.

A greywater system may supply water for underground landscape irrigation. The system typically contains one or more holding tanks, an underground distribution system connected to perforated irrigation pipe, an overflow gravity drain to the sewer or septic system, and a pump.

All greywater systems shall be considered a high health hazard. This is due to the potential for the greywater to contain human pathogens, even if connections to toilets are excluded (e.g., bath water may contain human fecal material).

Premises isolation at the water meter by an approved AG or reduced-pressure backflow assembly is required. The requirement is based on the:

- Assessment of a high health hazard of the greywater; and

- Probability that a connection could be made between the potable water system and greywater system to supplement the greywater supply.

Chapter 8. Cross-Connection Control Regulations and Related Materials

8.1 Acronyms and Abbreviations

	ABPA	American Backflow Prevention Association
AG	air gap	
ANSI	American National Standards Institute	
	ASR	Annual Summary Report
AVB	atmospheric vacuum breaker	
AWWA	American Water Works Association	
BAT	backflow assembly tester	
BPA	backflow prevention assembly	
CCC	cross-connection control	
CCS	cross-connection control specialist	
CV	single-check valve	
	DCAV	dual-check with atmospheric vent
	DCDA	double-check detector assembly
	DCV	dual-check backflow preventer
	DCVA	double-check valve assembly
DOH	Washington State Department of Health	
	EPA	U.S. Environmental Protection Agency
	HBVB	hose bib vacuum breaker
	IAPMO	International Association of Plumbing and Mechanical Officials
L&I	Washington State Department of Labor and Industries	
	LAA	Local Administrative Authority
	MCL	maximum contaminant level
	NTNC	non-transient non-community
	PNWS-AWWA	Pacific Northwest Section - American Water Works Association
	psi	pounds per square inch
PVBA	pressure vacuum breaker assembly	
PVC	polyvinyl chloride	
	PWS	public water system
	QA/QC	quality assurance/quality control
RCW	Revised Code of Washington	
ROW	right-of-way	
RPBA	reduced-pressure backflow assembly	
RPDA	reduced-pressure detector assembly	
SBCC	Washington State Building Code Council	
SDWA	Safe Drinking Water Act	
	SRC4	Spokane Regional Cross-Connection Control Committee

SVBA	spill-resistant vacuum breaker assembly	
	SWSMP	small water system management plan
	The Group	Western Washington Cross-Connection Prevention Professionals Group
	TNC	transient non-community
UBC	Uniform Building Code	
UL	Underwriters Laboratories, Inc.	
UPC	Uniform Plumbing Code	
	USC	University of Southern California
	USCFCCCHR	University of Southern California - Foundation for Cross-Connection Control and Hydraulic Research
WAC	Washington Administrative Code	
	WSP	water system plan

8.2 Washington Administrative Code 246-290-490

This section contains Washington State Department of Health drinking water regulations relating to cross-connection control, WAC 246-290-490. Section 490 has been extracted from WAC 246-290, the Group A Drinking Water Regulations. These regulations first became effective in April 1999. To enhance the completeness of the regulations, definitions, abbreviations and acronyms relating to cross connections which have been extracted from **WAC 246-290-010**.

8.2.1 Definitions Related to Cross-Connection Control

"Approved air gap" means a physical separation between the free-flowing end of a potable water supply pipeline and the overflow rim of an open or non-pressurized receiving vessel. To be an air gap approved by the department, the separation must be at least:

- Twice the diameter of the supply piping measured vertically from the overflow rim of the receiving vessel, and in no case be less than one inch, when unaffected by vertical surfaces (sidewalls); and

- Three times the diameter of the supply piping, if the horizontal distance between the supply pipe and a vertical surface (sidewall) is less than or equal to three times the diameter of the supply pipe, or if the horizontal distance between the supply pipe and intersecting vertical surfaces (sidewalls) is less than or equal to four times the diameter of the supply pipe and in no case less than one and one-half inches.

"Approved atmospheric vacuum breaker" means an AVB of make, model, and size that is approved by the department. *AVBs that appear on the current approved backflow prevention assemblies list developed by the University of Southern California Foundation for Cross-Connection Control and Hydraulic Research or that are listed or approved by other nationally recognized testing agencies (such as IAPMO, ANSI, or UL) acceptable to the local administrative authority are considered approved by the department.

"Approved backflow preventer" means an approved air gap, an approved backflow prevention assembly, or an approved AVB. The terms "approved backflow preventer," "approved air gap," or "approved backflow prevention assembly" refer only to those approved backflow preventers relied upon by the purveyor for the protection of the public water system. The requirements of WAC 246-290-490 do not apply to backflow preventers installed for other purposes.

"Approved backflow prevention assembly" means an RPBA, RPDA, DCVA, DCDA, PVBA, or SVBA of make, model, and size that is approved by the department. Assemblies that appear on the current approved backflow prevention assemblies list developed by the University of Southern California Foundation for Cross-Connection Control and Hydraulic Research or other entity acceptable to the department are considered approved by the department.

"Backflow" means the undesirable reversal of flow of water or other substances through a cross connection into the public water system or consumer's potable water system.

"Backflow assembly tester" means a person holding a valid BAT certificate issued in accordance with chapter 246-292 WAC.

"Backpressure" means a pressure (caused by a pump, elevated tank or piping, boiler, or other means) on the consumer's side of the service connection that is greater than the pressure provided by the public water system and which may cause backflow.

"Backsiphonage" means backflow due to a reduction in system pressure in the purveyor's distribution system and/or consumer's water system.

"Combination fire protection system" means a fire sprinkler system that:

- Is supplied only by the purveyor's water;
- Does not have a fire department pumper connection; and
- Is constructed of approved potable water piping and materials that serve both the fire sprinkler system and the consumer's potable water system.

"Consumer" means any person receiving water from a public water system from either the meter, or the point where the service line connects with the distribution system if no meter is present. For purposes of cross-connection control, "consumer" means the owner or operator of a water system connected to a public water system through a service connection.

"Consumer's water system," as used in WAC 246-290-490, means any potable and/or industrial water system that begins at the point of delivery from the public water system and is located on the consumer's premises. The consumer's water system includes all auxiliary sources of supply, storage, treatment, and distribution facilities, piping, plumbing, and fixtures under the control of the consumer.

"Cross connection" means any actual or potential physical connection between a public water system or the consumer's water system and any source of nonpotable liquid, solid, or gas that could contaminate the potable water supply by backflow.

"Cross-connection control program" means the administrative and technical procedures the purveyor implements to protect the public water system from contamination via cross connections as required in WAC 246-290-490.

"Cross-connection control specialist" means a person holding a valid CCS certificate issued in accordance with chapter 246-292 WAC.

"Cross-connection control summary report" means the annual report that describes the status of the purveyor's cross-connection control program.

"Flow-through fire protection system" means a fire sprinkler system that:

- Is supplied only by the purveyor's water;
- Does not have a fire department pumper connection;
- Is constructed of approved potable water piping and materials to which sprinkler heads are attached; and
- Terminates at a connection to a toilet or other plumbing fixture to prevent the water from becoming stagnant.

"High health cross-connection hazard" means a cross connection which could impair the quality of potable water and create an actual public health hazard through poisoning or spread of disease by sewage, industrial liquids or waste.

"In-premises protection" means a method of protecting the health of consumers served by the consumer's potable water system, located within the property lines of the consumer's premises by the installation of an approved air gap or backflow prevention assembly at the point of hazard, which is generally a plumbing fixture.

"Local administrative authority" means the local official, board, department, or agency authorized to administer and enforce the provisions of the Uniform Plumbing Code as adopted under chapter 19.27 RCW.

"Low health cross-connection hazard" means a cross connection that could cause an impairment of the quality of potable water to a degree that does not create a hazard to the public health, but does adversely and unreasonably affect the aesthetic qualities of such potable waters for domestic use.

“Premises Isolation” means a method of protecting a public water system by installation of approved air gaps or approved backflow prevention assemblies at or near the service connection or alternative location acceptable to the purveyor to isolate the consumer’s water system from the purveyor’s distribution system.

"Reclaimed water" means effluent derived in any part from sewage from a wastewater treatment system that has been adequately and reliably treated, so that as a result of that treatment, it is suitable for beneficial use or a controlled use that would not otherwise occur, and it is no longer considered wastewater.

"Unapproved auxiliary water supply" means a water supply (other than the purveyor's water supply) on or available to the consumer's premises that is either not approved for human consumption by the health agency having jurisdiction or is not otherwise acceptable to the purveyor.

"Uniform Plumbing Code" means the code adopted under RCW 19.27.031(4) and amended under chapter 51-46 WAC. This code establishes statewide minimum plumbing standards applicable within the property lines of the consumer's premises.

"Used water" means water which has left the control of the purveyor.

Abbreviations and Acronyms

AG	air gap
AVB	atmospheric vacuum breaker
BAT	backflow assembly tester (for WAC 246-290-490)
CCS	cross-connection control specialist
DCDA	double check detector assembly
DCVA	double check valve assembly
IAPMO	International Association of Plumbing and Mechanical Officials
PVBA	pressure vacuum breaker assembly
RPBA	reduced pressure backflow assembly

RPDA	reduced pressure detector assembly
SVBA	spill resistant vacuum breaker assembly
UBC	Uniform Building Code
UL	Underwriters Laboratories Inc.
UPC	Uniform Plumbing Code

8.2.2 WAC 246-290-490 Cross-Connection Control.

(1) Applicability, purpose, and responsibility.

(a) All community water systems shall comply with the cross-connection control requirements specified in this section.

(b) All non-community water systems shall apply the principles and provisions of this section, including subsection (4)(b) of this section, as applicable to protect the public water system from contamination via cross connections. Non-community systems that comply with subsection (4)(b) of this section and the provisions of WAC 51-46-0603 of the UPC (which addresses the installation of backflow preventers at points of water use within the potable water system) shall be considered in compliance with the requirements of this section.

(c) The purpose of the purveyor's cross-connection control program shall be to protect the public water system, as defined in WAC 246-290-010, from contamination via cross connections.

(d) The purveyor's responsibility for cross-connection control shall begin at the water supply source, include all the public water treatment, storage, and distribution facilities, and end at the point of delivery to the consumer's water system, which begins at the downstream end of the service connection or water meter located on the public right-of-way or utility-held easement.

(e) Under the provisions of this section, purveyors are not responsible for eliminating or controlling cross connections within the consumer's water system. Under chapter 19.27 RCW, the responsibility for cross-connection control within the consumer's water system, i.e., within the property lines of the consumer's premises, falls under the jurisdiction of the local administrative authority.

(2) General program requirements.

(a) The purveyor shall develop and implement a cross-connection control program that meets the requirements of this section, but may establish a more stringent program through local ordinances, resolutions, codes, bylaws, or operating rules.

(b) Purveyors shall ensure that good engineering and public health protection practices are used in the development and implementation of cross-connection control programs. Department publications and the most recently published editions of references, such as, but not limited to, those listed below, may be used as guidance for cross-connection program development and implementation:

(i) *Manual of Cross-Connection Control* published by the Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California (USC Manual); or

(ii) *Cross-Connection Control Manual, Accepted Procedure and Practice* published by the Pacific Northwest Section of the American Water Works Association (PNWS-AWWA Manual).

(c) The purveyor may implement the cross-connection control program, or any portion thereof, directly or by means of a contract with another agency or party acceptable to the department.

(d) The purveyor shall coordinate with the local administrative authority in all matters concerning cross-connection control. The purveyor shall document and describe such coordination, including delineation of responsibilities, in the written cross-connection control program required in (e) of this subsection.

(e) The purveyor shall include a written description of the cross-connection control program in the water system plan required under WAC 246-290-100 or the small water system management program required under WAC 246-290-105. The cross-connection control program shall include the minimum program elements described in subsection (3) of this section.

(f) The purveyor shall ensure that cross connections between the distribution system and a consumer's water system are eliminated or controlled by the installation of an approved backflow preventer commensurate with the degree of hazard. This can be accomplished by implementation of a cross-connection program that relies on:

(i) Premises isolation as defined in WAC 246-290-010; or

(ii) Premises isolation and in-premises protection as defined in WAC 246-290-010.

(g) Purveyors with cross-connection control programs that rely both on premises isolation and in-premises protection:

(i) Shall comply with the premises isolation requirements specified in subsection (4)(b) of this section; and

(ii) May reduce premises isolation requirements and rely on in-premises protection for premises other than the type not addressed in subsection (4)(b) of this section, if the conditions in (h) of this subsection are met.

(h) Purveyors may rely on in-premises protection only when the following conditions are met:

(i) The in-premises backflow preventers provide a level of protection commensurate with the purveyor's assessed degree of hazard;

(ii) Backflow preventers which provide the in-premises backflow protection meet the definition of approved backflow preventers as described in WAC 246-290-010;

(iii) The approved backflow preventers are installed, inspected, tested (if applicable), maintained, and repaired in accordance with subsections (6) and (7) of this section;

(iv) Records of such backflow preventers are maintained in accordance with subsections (3)(j) and (8) of this section; and

(v) The purveyor has reasonable access to the consumer's premises to conduct an initial hazard evaluation and periodic reevaluations to determine whether the in-premises protection is adequate to protect the purveyor's distribution system.

(i) The purveyor shall take appropriate corrective action within its authority if:

(i) A cross connection exists that is not controlled commensurate to the degree of hazard assessed by the purveyor; or

(ii) A consumer fails to comply with the purveyor's requirements regarding the installation, inspection, testing, maintenance or repair of approved backflow preventers required by this chapter.

(j) The purveyor's corrective action may include, but is not limited to:

(i) Denying or discontinuing water service to a consumer's premises until the cross-connection hazard is eliminated or controlled to the satisfaction of the purveyor;

(ii) Requiring the consumer to install an approved backflow preventer for premises isolation commensurate with the degree of hazard; or

(iii) The purveyor installing an approved backflow preventer for premises isolation commensurate with the degree of hazard.

(k) Purveyors denying or discontinuing water service to a consumer's premises for one or more of the reasons listed in (i) of this subsection shall notify the local administrative authority prior to taking such action except in the event of an emergency.

(l) The purveyor shall prohibit the intentional return of used water to the purveyor's distribution system. Such water would include, but is not limited to, water used for heating, cooling, or other purposes within the consumer's water system.

(3) Minimum elements of a cross-connection control program.

(a) To be acceptable to the department, the purveyor's cross-connection control program shall include the minimum elements identified in this subsection.

(b) Element 1: The purveyor shall adopt a local ordinance, resolution, code, bylaw, or other written legal instrument that:

(i) Establishes the purveyor's legal authority to implement a cross-connection control program;

(ii) Describes the operating policies and technical provisions of the purveyor's cross-connection control program; and

(iii) Describes the corrective actions used to ensure that consumers comply with the purveyor's cross-connection control requirements.

(c) Element 2: The purveyor shall develop and implement procedures and schedules for evaluating new and existing service connections to assess the degree of hazard posed by the consumer's premises to the purveyor's distribution system and notifying the consumer within a reasonable time frame of the hazard evaluation results. At a minimum, the program shall meet the following:

(i) For new connections made on or after the effective date of these regulations, procedures shall ensure that an initial evaluation is conducted before service is provided;

(ii) For existing connections made prior to the effective date of these regulations, procedures shall ensure that an initial evaluation is conducted in accordance with a schedule acceptable to the department; and

(iii) For all service connections, once an initial evaluation has been conducted, procedures shall ensure that periodic reevaluations are conducted in accordance with a schedule

acceptable to the department and whenever there is a change in the use of the premises.

(d) Element 3: The purveyor shall develop and implement procedures and schedules for ensuring that:

(i) Cross connections are eliminated whenever possible;

(ii) When cross connections cannot be eliminated, they are controlled by installation of approved backflow preventers commensurate with the degree of hazard; and

(iii) Approved backflow preventers are installed in accordance with the requirements of subsection (6) of this section.

(e) Element 4: The purveyor shall ensure that personnel, including at least one person certified as a CCS, are provided to develop and implement the cross-connection control program.

(f) Element 5: The purveyor shall develop and implement procedures to ensure that approved backflow preventers are inspected and/or tested (as applicable) in accordance with subsection (7) of this section.

(g) Element 6: The purveyor shall develop and implement a backflow prevention assembly testing quality control assurance program, including, but not limited to, documentation of tester certification and test kit calibration, test report contents, and time frames for submitting completed test reports.

(h) Element 7: The purveyor shall develop and implement (when appropriate) procedures for responding to backflow incidents.

(i) Element 8: The purveyor shall include information on cross-connection control in the purveyor's existing program for educating consumers about water system operation. Such a program may include periodic bill inserts, public service announcements, pamphlet distribution, notification of new consumers and consumer confidence reports.

Element 9: The purveyor shall develop and maintain cross-connection control records including, but not limited to, the following:

(i) A master list of service connections and/or consumer's premises where the purveyor relies upon approved backflow preventers to protect the public water system from contamination, the assessed hazard level of each, and the required backflow preventer(s);

(ii) Inventory information on:

(A) Approved air gaps installed in lieu of approved assemblies including exact air gap location, assessed degree of hazard, installation date, history of inspections, inspection results, and person conducting inspections;

(B) Approved backflow assemblies including exact assembly location, assembly description (type, manufacturer, model, size, and serial number), assessed degree of hazard, installation date, history of inspections, tests and repairs, test results, and person performing tests; and

(C) Approved AVBs used for irrigation system applications including location, description (manufacturer, model, and size), installation date, history of inspection(s), and person performing inspection(s).

(iii) Cross-connection program summary reports and backflow incident reports required under subsection (8) of this section.

(k) Element 10: Purveyors who distribute and/or have facilities that receive reclaimed water within their water service area shall meet any additional cross-connection control requirements imposed by the department under a permit issued in accordance with chapter 90.46 RCW.

(4) Approved backflow preventer selection.

(a) The purveyor shall ensure that a CCS:

(i) Assesses the degree of hazard posed by the consumer's water system upon the purveyor's distribution system; and

(ii) Determines the appropriate method of backflow protection for premises isolation in accordance with Table 8.

Table 8 of WAC 246-290-490
Appropriate Methods of
Backflow Protection for Premises Isolation

Degree of Hazard	Application Condition	Appropriate Approved Backflow Preventer
High health cross-connection hazard	Backsiphonage or backpressure backflow	AG, RPBA, or RPDA
Low health cross-connection hazard	Backsiphonage or backpressure backflow	AG, RPBA, RPDA, DCVA, or DCDA

(b) Premises isolation requirements.

(i) For service connections with premises posing a high health cross-connection hazard including, but not limited to, those premises listed in Table 9 of WAC 246-290-490, the purveyor shall ensure that an approved air gap or RPBA is installed for premises isolation.

(ii) If the purveyor's CCS determines that no hazard exists for a connection serving premises of the type listed in Table 9 of WAC 246-290-490, the requirements of (b)(i) of this subsection do not apply.

(iii)The purveyor shall document, on a case-by-case basis, the reasons for not applying the requirements of (b)(i) of this subsection to a connection serving premises of the type listed in Table 9 of WAC 246-290-490 and include such documentation in the cross-connection control program summary report required in subsection (8) of this section.

Table 9 of WAC 246-290-490
High Health Cross-Connection Hazard Premises
Requiring Premises Isolation by AG or RPBA

Agricultural (farms and dairies)
Beverage bottling plants
Car washes
Chemical plants
Commercial laundries and dry cleaners
Premises where both reclaimed water and potable water are provided
Film processing facilities
Food processing plants
Hospitals, medical centers, nursing homes, veterinary, medical and dental clinics, and blood plasma centers
Premises with separate irrigation systems using the purveyor's water supply and with chemical addition.+
Laboratories
Metal plating industries
Mortuaries
Petroleum processing or storage plants
Piers and docks
Radioactive material processing plants or nuclear reactors.*
Survey access denied or restricted
Wastewater lift stations and pumping stations
Wastewater treatment plants.*
Premises with an unapproved auxiliary water supply interconnected with the potable water supply

\+ For example, parks, playgrounds, golf courses, cemeteries, estates, etc.

* RPBAs for connections serving these premises are acceptable only when used in combination with an in-plant approved air gap; otherwise, the purveyor shall require an approved air gap at the service connection.

(c) Backflow protection for single-family residences.

(i) For single-family residential service connections, the purveyor shall comply with the requirements of (b) of this subsection when applicable.

(ii) If the requirements of (b) of this subsection do not apply and the requirements specified in subsection (2)(h) of this section are met, the purveyor may rely on backflow protection provided at the point of hazard in accordance with WAC 51-46-0603 of the UPC for hazards such as, but not limited to:

(A) Irrigation systems;

(B) Swimming pools or spas;

(C) Ponds; and

(D) Boilers.

For example, the purveyor may accept an approved AVB on a residential irrigation system, if the AVB is properly installed in accordance with the UPC.

(d) Backflow protection for fire protection systems.

(i) Backflow protection is not required for residential flow-through or combination fire protection systems constructed of potable water piping and materials.

(ii) For service connections with fire protection systems other than flow-through or combination systems, the purveyor shall ensure that backflow protection consistent with WAC 51-46-0603 of the UPC is installed. The UPC requires minimum protection as follows:

(A) An RPBA or RPDA for fire protection systems with chemical addition or using unapproved auxiliary water supply; and

(B) A DCVA or DCDA for all other fire protection systems.

(iii) For new connections made on or after the effective date of these regulations, the purveyor shall ensure that backflow protection is installed before water service is provided.

(iv) For existing fire protection systems:

(A) With chemical addition or using unapproved auxiliary supplies, the purveyor shall ensure that backflow protection is installed within ninety days of the purveyor notifying the consumer of the high health cross-connection hazard or in accordance with an alternate schedule acceptable to the purveyor.

(B) Without chemical addition, without on-site storage, and using only the purveyor's water (i.e., no unapproved auxiliary supplies on or available to the premises), the purveyor shall ensure that backflow protection is installed in accordance with a schedule acceptable to the purveyor or at an earlier date if required by the agency administering the Uniform Building Code as adopted under chapter 19.27 RCW.

(C) When establishing backflow protection retrofitting schedules for fire protection systems that have the characteristics listed in (d)(iv)(B) of this subsection, the purveyor may consider factors such as, but not limited to, impacts of assembly installation on sprinkler performance, costs of retrofitting, and difficulty of assembly installation.

(e) Purveyors may require backflow preventers commensurate with the degree of hazard determined by the purveyor to be installed for premises isolation for connections serving premises that have characteristics such as, but not limited to, the following:

(i) Complex plumbing arrangements or plumbing potentially subject to frequent changes that make it impracticable to assess whether cross-connection hazards exist;

(ii) A repeated history of cross connections being established or reestablished; or

(iii) Cross-connection hazards are unavoidable or not correctable, such as, but not limited to, tall buildings.

(5) Approved backflow preventers.

(a) The purveyor shall ensure that all backflow prevention assemblies relied upon by the purveyor are models included on the current list of backflow prevention assemblies approved for use in Washington state. The current approved assemblies list is available from the department upon request.

(b) The purveyor may rely on testable backflow prevention assemblies that are not currently approved by the department, if the assemblies:

(i) Were included on the department and/or USC list of approved backflow prevention assemblies at the time of installation;

(ii) Have been properly maintained;

(iii) Are commensurate with the purveyor's assessed degree of hazard; and

(iv) Have been inspected and tested at least annually and have successfully passed the annual tests.

(c) The purveyor shall ensure that an unlisted backflow prevention assembly is replaced by an approved assembly commensurate with the degree of hazard, when the unlisted assembly:

(i) Does not meet the conditions specified in (b)(i) through (iv) of this subsection;

(ii) Is moved; or

(iii) Cannot be repaired using spare parts from the original manufacturer.

(d) The purveyor shall ensure that AVBs meet the definition of approved atmospheric vacuum breakers as described in WAC 246-290-010.

(6) Approved backflow preventer installation.

(a) The purveyor shall ensure that approved backflow preventers are installed in the orientation for which they are approved (if applicable).

(b) The purveyor shall ensure that approved backflow preventers are installed in a manner that:

(i) Facilitates their proper operation, maintenance, inspection, and/or in-line testing (as applicable) using standard installation procedures acceptable to the department such as those in the USC Manual or PNWS-AWWA Manual;

(ii) Ensures that the assembly will not become submerged due to weather-related conditions such as flooding; and

(iii) Ensures compliance with all applicable safety regulations.

(c) The purveyor shall ensure that approved backflow assemblies for premises isolation are installed at a location adjacent to the meter or property line or an alternate location acceptable to the purveyor.

(d) When premises isolation assemblies are installed at an alternate location acceptable to the purveyor, the purveyor shall ensure that there are no connections between the point of delivery from the public water system and the approved backflow assembly, unless the installation of such a connection meets the purveyor's cross-connection control requirements and is specifically approved by the purveyor.

(e) The purveyor shall ensure that approved backflow preventers are installed in accordance with the following time frames:

(i) For new connections made on or after the effective date of these regulations, the following conditions shall be met before service is provided:

(A) The provisions of subsection (3)(d)(ii) of this section; and

(B) Satisfactory completion of a test by a BAT in accordance with subsection (7) of this section.

(ii) For existing connections where the purveyor identifies a high health cross-connection hazard, the provisions of (3)(d)(ii) of this section shall be met:

(A) Within ninety days of the purveyor notifying the consumer of the high health cross-connection hazard; or

(B) In accordance with an alternate schedule acceptable to the purveyor.

(iii) For existing connections where the purveyor identifies a low health cross-connection hazard, the provisions of subsection (3)(d)(ii) of this section shall be met in accordance with a schedule acceptable to the purveyor.

(f) The purveyor shall ensure that bypass piping installed around any approved backflow preventer is equipped with an approved backflow preventer that:

(i) Affords at least the same level of protection as the approved backflow preventer that is being bypassed; and

(ii) Complies with all applicable requirements of this section.

(7) Approved backflow preventer inspection and testing.

(a) The purveyor shall ensure that:

(i) A CCS inspects backflow preventer installations to ensure that protection is provided commensurate with the assessed degree of hazard;
(ii) Either a BAT or CCS inspects:

(A) Air gaps installed in lieu of approved backflow prevention assemblies for compliance with the approved air gap definition; and

(B) Backflow prevention assemblies for correct installation and approval status.

(iii) A BAT tests approved backflow prevention assemblies for proper operation.

(b) The purveyor shall ensure that inspections and/or tests of approved air gaps and approved backflow assemblies are conducted:

(i) At the time of installation;

(ii) Annually after installation, or more frequently, if required by the purveyor for connections serving premises or systems that pose a high health cross-connection hazard or for assemblies that repeatedly fail;

(iii) After a backflow incident; and

(iv) After an assembly is repaired, reinstalled, or relocated or an air gap is replumbed.

(c) The purveyor shall ensure that inspections of AVBs installed on irrigation systems are conducted:

(i) At the time of installation;

(ii) After a backflow incident; and

(iii) After repair, reinstallation, or relocation.

(d) The purveyor shall ensure that approved backflow prevention assemblies are tested using procedures acceptable to the department, such as those specified in the most recently published edition of the USC Manual. When circumstances, such as, but not limited to, configuration or location of the assembly, preclude the use of USC test procedures, the purveyor may allow, on a case-by-case basis, the use of alternate (non-USC) test procedures acceptable to the department.

(e) The purveyor shall ensure that results of backflow prevention assembly inspections and tests are documented and reported in a manner acceptable to the purveyor.

(f) The purveyor shall ensure that an approved backflow prevention assembly or AVB, whenever found to be improperly installed, defective, not commensurate with the degree of hazard, or failing a test (if applicable) is properly reinstalled, repaired, overhauled, or replaced.

(g) The purveyor shall ensure that an approved air gap, whenever found to be altered or improperly installed, is properly replumbed or, if commensurate with the degree of hazard, is replaced by an approved RPBA.

(8) Recordkeeping and reporting.

(a) Purveyors shall keep cross-connection control records for the following time frames:

(i) Records pertaining to the master list of service connections and/or consumer's premises required in subsection (3)(j)(i) of this section shall be kept as long as the premises pose a cross-connection hazard to the purveyor's distribution system;

(ii) Records regarding inventory information required in subsection (3)(j)(ii) of this section shall be kept for five years or for the life of the approved backflow preventer whichever is shorter; and

(iii)Records regarding backflow incidents and annual summary reports required in subsection (3)(j)(iii) of this section shall be kept for five years.

(b) Purveyors may maintain cross-connection control records in original form or transfer data to tabular summaries.

(c) Purveyors may maintain records or data in any media, such as paper, film, or electronic format.

(d) The purveyor shall complete the cross-connection control program summary report annually. Report forms and guidance on completing the report are available from the department.

(e) The purveyor shall make all records and reports required in subsection (3)(j) of this section available to the department or its representative upon request.

(f) The purveyor shall notify the department, local administrative authority, and local health jurisdiction as soon as possible, but no later than the end of the next business day, when a backflow incident is known by the purveyor to have:

(i) Contaminated the public water system; or

(ii) Occurred within the premises of a consumer served by the purveyor.

(g) The purveyor shall:

(i) Document details of backflow incidents on a form acceptable to the department such as the backflow incident report form included in the most recent edition of the PNWS-AWWA Manual; and

(ii) Include all backflow incident report(s) in the annual cross-connection program summary report referenced in (d) of this subsection, unless otherwise requested by the department.

8.3 Frequently Asked Regulatory Interpretation Questions and Answers

Section 1 Applicability, Purpose, and Responsibility

Q. Do all non-community systems have to develop and implement Cross-Connection Control (CCC) Programs?

A. *Yes. The intent is to provide the same level of public health protection for non-community water systems as small Group A community systems. Non-community systems can use this manual as guidance for development and implementation of their CCC programs.*

Q. How do the minimum elements in Section 3 of Washington Administrative Code (WAC) 246-290-490 apply to non-community systems, especially single-purpose systems, where the purveyor and customer are essentially the same?

A. *The elements of Section 3 apply to all Group A systems. However, the effort needed to comply may be minimal for some non-community systems. For a single-purpose system, it may only be necessary to confirm in a hazard assessment that protection of the source of supply is adequate. Depending on the nature of the system, source protection could be achieved through installation of a backflow preventer to directly protect the source and/or through installation of backflow preventers at the points of hazard (i.e., fixtures) per the Uniform Plumbing Code (UPC). A sample written CCC program for a non-community system is provided in Appendix B of this manual. The sample program contains the minimum elements listed in WAC 246-290-490(3).*

Q. Was the intent for large non-community systems to "just" comply with the Uniform Plumbing Code (UPC)? Would premises isolation ever be appropriate for a large non-community system?

A. *No, it was not the intent for large non-community systems to merely comply with the UPC. For most non-community systems, Washington State Department of Health (DOH) and the Local Administrative Authority (LAA) have overlapping jurisdictions. Thus, non-community systems must comply with both WAC 246-290-490 and the UPC. Regarding the UPC, the non-community system must comply with the plumbing code in effect at the time the plumbing permit was issued (i.e., at time of construction).*

Regarding WAC 246-290-490, premises isolation may be appropriate, and in some cases required, for large non-community systems, depending on the types of hazards posed to the distribution system. The CCC requirements of WAC 246-290-490 are, in some cases, more stringent than the UPC, specifically in the area of mandatory premises isolation. So merely complying with the UPC would not provide the protection required by the drinking water regulations. For a non-community system, area, building, and/or source isolation may be needed to protect the distribution system and source of supply from contamination via cross-connections (i.e., from being a conduit for the spread of contaminants between buildings or areas of concentration of population).

Section 2 General Program Requirements

Q. Do alternate references have to be acceptable to Washington State Department of Health (DOH)? What criteria does DOH use to accept alternate references?

A. *The purveyor's CCC program must be acceptable to DOH. The DOH regional engineer reviewing a CCC program will accept the two publications listed as guidance in WAC 246-290-490. Alternate guidance manuals may be acceptable, if certain criteria are met. The criteria DOH uses to accept alternate references are: 1) The manual reflects current industry practices and standards; 2). The manual has been produced by a nationally recognized organization with expertise in cross-connection control, such as American Water Works Association (AWWA), University of Southern California Foundation for Cross Connection Control and Hydraulic Research (USCFCCCHR), American Backflow Prevention Association (ABPA), or United States Environmental Protection Agency (EPA); and 3). The manual has undergone association and/or peer review by AWWA, USCFCCCHR, ABPA, federal and/or state public health officials and professional engineers.*

Q. Will the department develop a "public listing" of Washington State Department of Health (DOH) certified Cross-Connection Control Specialists (CCSs) willing to act as consultants to small water systems? What are the guidelines for hiring a CCS?

A. *DOH has developed a contract operators public listing. All contract operators must be DOH-certified CCSs. The contract operators list is available on the Office of Drinking Water's website:* http://www.doh.wa.gov/

DOH does not have a brochure developed that provides specific guidelines for hiring a contract CCS. However, this issue is discussed in detail in Chapter 7. Before hiring a CCS on contract, at a minimum, purveyors are strongly encouraged to carefully check the CCS's:

- *Familiarity with the most recently published version of WAC 246-290-490;*
- *Relevant experience with other similar water systems;*
- *Extent of coordination with DOH headquarters and regional office CCC staff;*
- *Participation in the DOH CCC-related committees;*
- *Participation in regional and national CCC groups; and*
- *Public water system (PWS) references (at least 3).*

Sample CCC written programs developed by the CCS should also be available for the purveyor to review. It is recommended that proposals be obtained from at least three CCSs. Some contract operators may have minimal experience in the development and implementation of CCC programs. Thus, in addition to the DOH Contract Operators list, purveyors are encouraged to network with their regional CCC groups for a list of more experienced consultant CCSs.

Note: High prices do not necessarily indicate quality work. Contracts should specify that the written CCC program plan produced must comply with the current WAC 246-290-490. Availability for technical consultation on an as-needed basis is an item to also consider including in the contract. Another suggestion is to include language in the contract that final payment will not be made by the purveyor, until the written program plan has been reviewed and accepted by DOH.

Q. What does "coordination" with Local Administrative Authority (LAA) mean?

A. ***Coordination*** *is explained in detail in Chapter 6. Coordination may range from a minimal effort, i.e., an exchange of information with the LAA, to an extensive level of coordination, i.e., implementation of a joint program. The advantages and disadvantages of the range of levels of coordination are discussed in Chapter 6. Purveyors must describe the level of coordination in their written CCC program plans. When a joint program is selected as the preferred option, although not required, DOH recommends that a written agreement be developed between the purveyor and the LAA.*

Note: Efforts are currently underway in Snohomish County to develop standardized language to use when developing written coordination agreements between purveyors and LAAs in Washington. Purveyors are encouraged to stay informed about this effort through their regional CCC groups. Once developed, DOH hopes to incorporate the sample agreement language into a future update of this manual.

Q. Must a Cross-Connection Control program be submitted to Washington State Department of Health (DOH) for review?

A. *Yes, per WAC246-290-490(2)(e), it was DOH's intent for written program plans to be included in the purveyor's Water System Plan (WSP) or Small Water System Management Program (SWSMP) that are submitted to DOH for review and approval. However, not all Group A systems must submit WSPs or SWSMPs. For example, small, non-expanding water systems are not required to submit planning documents, unless specifically requested to do so by DOH due to system operational problems. DOH also intended to be able to request submission of the purveyor's written CCC program plan as a stand-alone document or to request that the plan be made available for review as part of the sanitary survey process.*

Q. Can a purveyor rely solely upon a premises isolation program or rely solely upon an in-premises program to protect the public water system (PWS) from contamination?

A. *Purveyors may rely solely upon premises isolation programs to protect their systems from contamination. However, the opposite is not true. Thus, purveyors can't rely solely upon in-premises programs to protect the PWS from contamination. An in-premises type of program is unacceptable, because the CCC regulations require all purveyors to ensure that premises isolation is provided for high health hazard categories of premises of the type listed in Table 9 of WAC 246-290-490.*

Systems do have the option of implementing a combination program that relies on premises isolation for high-hazard premises and relies on in-premises protection for non-high hazard premises. When the purveyor chooses this combination program option, all conditions in WAC 246-290-490(2)(h) must be met.

Q. Are purveyors required to shut-off or deny water service to customers that fail to comply with the purveyor's cross-connection control requirements?

A. *No, water shut-off is only one of the enforcement tools available to purveyors. The responsibility of the purveyor is to protect the PWS from contamination. Water shut-off may be appropriate under emergency conditions (e.g., backflow incident occurring, cross connection with sewage). However, in lieu of water shutoff, the purveyor may choose to install the necessary backflow preventer, if the customer fails to comply with the request to install a backflow preventer.*

Shutting off water service may cause a public health hazard. In addition, shutting off water service without reasonable cause or adequate legal authority may expose the purveyor to a

claim for damages. DOH is in the process of developing guidance to purveyors regarding water shutoff. Once finalized, DOH plans to include the guidance material in this manual.

Q. Why is it necessary to notify the Local Administrative Authority (LAA), before I shut off a customer's water?

A. *This requirement is in the regulations, because the purveyor's actions may affect the public health and safety of occupants and/or users of the customer's premises. For example, the shut off of potable water service affects building occupancy, adding a double-check valve assembly (DCVA) on the service affects thermal expansion, and the shutoff of a fire line affects public safety. For liability management, the purveyor should not take any action known to affect public health or safety without notifying the LAA having jurisdiction.*

Q. Why is it necessary to prevent the intentional return of water to the distribution system (e.g., from heat exchangers)?

A. *In a PWS, the normal flow of water is from the source of supply to the customer's tap. Thus, many contaminants introduced into the customer's plumbing system by the customer (through backflow incidents, inadequate disinfection of repair work, etc.) will likely remain in the customer's system, until the customer's normal use flushes the contaminants from a tap.*

However, a return system circumvents this natural protection for the PWS. More importantly, the purveyor has no control over the quality of water that has left the purveyor's distribution system. Even when the returned water is supposedly potable, a change in temperature may adversely affect the purveyor's system (e.g., increased water temperature may enhance bacteria re-growth in the distribution system). Prohibiting the intentional return of used water to the purveyor's distribution system protects the quality of water served to consumers.

Section 3 Minimum Elements of a Cross-Connection Control (CCC) Program

Q. Do the regulations specify when purveyors need to complete their initial hazard assessments?

A. *The regulations do not specify an absolute time frame for completing initial hazard assessments. Chapter 7 of this manual includes general schedule guidelines.*

The revised CCC regulations became effective in April 1999. As of the publication date of this manual, all Group A systems should have at least initiated their CCC programs. At a minimum, DOH will review the purveyor's written program plan when a system submits a WSP or SWSMP. The written program plan must include procedures and reasonable schedules for ensuring completion of initial hazard assessments for existing and new customers.

For example, a plan may indicate for existing customers that the initial hazard evaluations will be completed within one year of program startup. For new connections, the purveyor should now be making initial hazard evaluations prior to service being provided. As a practical matter, the purveyor will need to first establish a CCC policy, retain the services of a CCS, etc. before assessing hazards.

Purveyors will show DOH their system's implementation progress through submission of the Annual Summary Report (ASR) forms, and/or through sanitary surveys.

Q. When must the purveyor start installing backflow prevention assemblies?

A. *The CCC regulations do not establish an absolute time frame. However, Chapter 7 of this manual includes general guidelines. The purveyor's written program plan must establish procedures and schedules for backflow preventer installation. The time allowed should be based on the degree of hazard posed to the PWS. For example, a plan may specify that all customers of the type listed on Table 9 of WAC 246-290-490 will have backflow prevention installed within two years of notification and that all low-hazard fire lines will have backflow prevention installed when the building is renovated or enlarged.*

Q. What is an acceptable time frame for submission of a test report?

A. *A reasonable time frame for a backflow assembly tester (BAT) to provide the customer with a test report is within ten business days of performing the test. In general, for the annual backflow assembly test report, most purveyors allow customers 30 to 45 days to submit the paperwork from the anniversary date. In rural areas, where only a few BATs are available, purveyors may need to allow a longer period (e.g., 45-60 days). Purveyors need to make sure their customer's receive notice for the test long before the anniversary date. Purveyors should not send out the testing notices at the last minute and expect their customers to rush to comply.*

Note: The annual test doesn't need to be completed on the precise anniversary date of the last test. Most purveyors consider a timeframe within thirty days of the anniversary date reasonable for the annual test to be performed.

Q. What is the purpose of the quality assurance/quality control (QA/QC) program?

A. *The purpose of the QA/QC program is to ensure consistency and reliability in the testing of assemblies that protect the PWS. Although not fail-proof, the quality assurance program should help prevent and/or reduce some of the problems purveyors have encountered in the past with BAT performance. These problems have included submission of incomplete or false test reports, use of incorrect test procedures, and testing errors made due to improperly calibrated test equipment. Also, the additional hands-on training time in BAT courses and tightening of the DOH BAT certification exam process should help improve BAT performance statewide.*

Section 4 Approved Backflow Preventer Selection

Q. Are purveyors limited to the categories in Table 9 of Washington Administrative Code (WAC) 246-290-490 for mandatory premises isolation?

A. *No. Table 9 of WAC 246-290-490 is not all-inclusive, and in fact, only identifies typical high-hazard categories of premises served by most large PWSs in Washington. Table 9 of WAC 246-290-490 is essentially the minimum list of categories that require premises isolation. Other states and technical references may include additional categories in their mandatory premises isolation lists.*

Purveyors must ensure that all premises of the type listed on Table 9 of WAC 246-290-490 meet the mandatory premises isolation requirements. Although purveyors may not delete a mandatory isolation category from Table 9 of WAC 246-290-490, they may add to the Table 9 of WAC 246-290-490 list.

Additions may be based on industry guidance and the purveyor's policy for risk and liability management. For example, airline manufacturing plants are not specifically listed on Table 9 of WAC 246-290-490, but must be considered as high hazard premises for the few PWSs in Washington that provide water service to them. As another example, for risk and liability management, a purveyor may choose to require premises isolation DCVAs on all malls, because of the complexity of their piping systems and high probability of changes in tenants (i.e., water use).

Q. Some of the categories on Table 9 of Washington Administrative Code (WAC) 246-290-490 are confusing. For example, are gas stations included in the Petroleum Storage and Processing category? Are restaurants included in the Food Processing Plant category?

A. *The intent of Table 9 of WAC 246-290-490 is to identify typical categories of facilities that pose a high health hazard to the PWS. This rating is due to one or more of the following: the complexity of their plumbing and industrial piping systems, frequency of plumbing and piping changes, scale of operations (large, commercial), the presence of hazardous materials, and/or hazardous processes/activities occurring on-site.*

DOH intended for the category Petroleum Storage and Processing facilities to address bulk storage facilities (i.e., tank farms) and refineries; DOH did not intend for this category to include neighborhood gas stations. Similarly, DOH intended for the Food Processing Plant category to address canneries, beef packing houses, potato processors, fruit processors, etc., and in general did not intend for the category to include local restaurants.

Q. Which irrigation systems require premises isolation?

A. *The UPC establishes backflow protection requirements for irrigation systems in Washington. However, the UPC does not cover* ***dedicated*** *irrigation systems supplied directly from the purveyor's distribution main (i.e., not supplied through customer's domestic service line).* ***Under Table 9 of WAC 246-290-490, irrigation systems with chemical addition that are supplied through a dedicated line (i.e., separate from the domestic service line) require premises isolation with a reduced-pressure backflow assembly (RPBA).*** *Dedicated irrigation lines are typically found at parks, playgrounds, golf courses, cemeteries, and estates.*

The UPC requires an RPBA on other irrigation systems with chemical addition. For irrigation systems without chemical addition, the UPC requires a DCVA, pressure vacuum breaker assembly (PVBA) or atmospheric vacuum breaker (AVB). The purveyor's written program plan should address irrigation systems and indicate whether:

- *AVBs will be accepted to protect the PWS; or*
- *An approved assembly (e.g., a testable DCVA) will be required.*

Q. Is there a provision in the Washington Administrative Code (WAC) for the purveyor to grant an exception to the mandatory premises isolation requirements for premises of the type listed on Table 9 of WAC 246-290-490?

A. *Yes, the WAC does contain such a provision. The exception provision is to be used in those rare instances where the customer's water use and hazard posed to the purveyor's system don't "match" the water use and high health hazard typically associated with the specific category of premises. For example, a "beverage bottling plant" used only as a storage warehouse doesn't pose the same degree of hazard as a plant where beverage bottling processes are taking place. The purveyor's CCS must assess the degree of hazard and determine whether the granting of an exception is appropriate. CCSs can use the "good engineering practices" described in the technical publications referenced in WAC 246-290-490(2) to aid in exception determinations.*

When exceptions to mandatory premises isolation are granted, the CCS must document the reasons, i.e., provide justification for granting the exception. DOH has developed an Exception Form for documenting the justification for granting an exception. An Exception Form must be completed for each exception granted by the purveyor. After the initial ASR is completed and submitted to DOH, Exception Forms must be submitted to DOH with the ASR for the reporting year in which the exception was granted.

Q. As an "alternate location acceptable to the purveyor," how far downstream of the meter may a premises isolation assembly be located?

A. *There is no general rule in terms of distance. However, for risk management reasons, it is preferable that the assembly be located as close to the meter (property line) as possible and that no connections are made between the meter and the RPBA.*

For freeze protection, many purveyors allow the RPBA to be installed in the mechanical room of the building or at the point where the service line just enters the building. Because the RPBA must isolate the customer's plumbing from the PWS, there can be no connections made between the RPBA and the meter, unless they are specifically approved by the purveyor and have the appropriate backflow protection.

Q. Must backflow protection for all existing fire sprinkler systems with chemical addition be upgraded to a reduced-pressure backflow assembly (RPBA) within 90 days of notifying the customer of the high health cross-connection hazard?

A. *No. The WAC allows an alternate schedule acceptable to the purveyor to be adopted. The 90 days indicates the high health hazard assessment of fire sprinkler systems with chemical addition and the need to give priority to the installation of an RPBA.*

The purveyor should work with the customer to establish a reasonable schedule for installation of the backflow preventer. However, for risk management reasons, the earliest possible installation date provides the most benefit to the purveyor. When working with customers to establish a mutually agreeable schedule, purveyors should consider the practical aspects of retrofitting an existing sprinkler system with the appropriate backflow protection (e.g., cost, obtaining permits, impacts on sprinkler performance, possible redesign of fire system, space limitations and scheduling a contractor). In some situations, the customer may need as long as two years to get the backflow preventer installed (e.g., hospital).

Note: The RPBA requirement for high-hazard fire sprinkler systems should be imposed when the customer remodels or expands the building.

Q. How can the customer obtain water to test plumbing, before backflow preventers are installed and tested?

A. *Normal practice is to provide a construction service with a water meter and an RPBA (DCVA minimum). A construction site often poses a greater cross-connection hazard to the PWS than the completed facility.*

Section 5 Approved Backflow Preventers

Q. Where do I obtain a current list of Washington State Department of Health (DOH) approved assemblies?

A. *Purveyors may obtain hard copies of the list from DOH Office of Drinking Water upon request. The Training and Outreach Section handles such requests. Purveyors without Internet access can request the list by e-mail or by phone (see Appendix F for DOH contact information). Purveyors with Internet access can request a list via the Drinking Water website:* http://www.doh.wa.gov/ehp/dw

Due to our agreement with USC (the organization that develops the list), DOH is not allowed to post the list on the Drinking Water website. DOH publishes the list annually (at the beginning of each calendar year) and issues at least one update during the year. DOH automatically sends updates to those systems, CCSs, BATs, etc., on file with DOH as having requested a list at the beginning of the calendar year.

The purveyor's CCS should have a copy of the most recently published DOH-Approved Assemblies List and understand how to use the information on the list.

Section 6 Approved Backflow Preventer Installation

Q. What are the requirements for installation?

A. *The standard installation procedures acceptable to DOH are provided in the technical publications such as the USC Manual or Pacific Northwest Section – American Water Works Association (PNWS-AWWA) Manual. Large utilities and/or the regional cross-connection groups may also have standard installation plans available that meet the technical specifications in the CCC manuals and can be used by small water systems.*

Q. Can a double-check valve assembly (DCVA) be installed in a below-ground pit? What about the requirement that the purveyor ensure that an assembly is not flooded?

A. *Yes, a DCVA can be installed below grade (e.g., in a meter box). The intent of the language regarding flooding was to prevent backflow assemblies from creating cross-connection hazards themselves. To meet the intent of the WAC, with a below-grade type of installation, the purveyor must ensure that the assembly will not create a cross connection with ground water. This can be accomplished by requiring test cock plugs to be installed with all below-grade assemblies.*

Section 7 Approved Backflow Preventer Inspection and Testing

Q. Must a cross-connection control specialist (CCS) inspect an atmospheric vacuum breaker (AVB) on a residential lawn sprinkler system?

A. *Yes. All AVBs relied upon by the purveyor must inspected by a CCS at the time of installation, after a backflow incident and after repair, re-installation and re-inspection. The purpose of the inspection is to make sure the AVB is installed correctly and is operable, etc. The USC foundation recommends that AVBs be checked annually.*

Q. Annual assembly testing is a Washington State Department of Health (DOH) minimum requirement. When would it be appropriate for a purveyor to require more testing?

A. *More frequent testing is appropriate when an assembly shows (from the historical test reports) signs of impending failure, but the assembly has not been replaced. For example, if there is a question about the reliability of the assembly, the purveyor should require another test in six months. In addition, some purveyors require more frequent testing for premises isolation assemblies installed at severe and high-hazard facilities such as nuclear facilities, sewage treatment plants, and hospitals.*

Section 8 Recordkeeping and Reporting

Q. What documentation must be kept?

A. *For each connection served, the purveyor must keep:*

- *Information on the initial and subsequent hazard assessments (e.g., questionnaire and survey); and*

- *Detailed assembly inventory information for all assemblies relied upon by the purveyor to protect the PWS. Actual test report readings should be recorded and kept as part of the required assembly test report information.*

For connections with both a premises isolation assembly and one or more in-premises assemblies, the purveyor is only required to track information on the premises isolation assembly. All assemblies other than the premises isolation assembly fall under the jurisdiction of the Local Administrative Authority.

Q. When should records of test reports be kept in electronic format (i.e., other than manually)?

A. The WAC allows records to be kept manually on paper or in electronic format, so the decision is left to the purveyor. Most systems find that manual tracking becomes too difficult, when the number of assemblies that protect the PWS reaches 100 or more.

Because they will have so few assemblies to track, many small water systems may be able to keep adequate records manually. However, where a personal computer is used for word processing, it is a relatively easy task to establish a computer spreadsheet to track test reports. Most small systems will not need to purchase more expensive, proprietary computer database software specifically designed for CCC program management.

Q. Must all backflow incidents be reported to DOH?

A. *Yes. Purveyors must notify DOH, the local administrative authority, and the local health jurisdiction as soon as possible and no later than the next business day of any backflow incident that contaminates the PWS or customer's plumbing. Purveyors can consult the PNWS-AWWA Backflow Incident Investigation Manual for information on how to proceed with investigation and clean up.*

The purveyor must document (on a form acceptable to DOH) the details of any incidents that contaminated the PWS. However, for risk management purposes, it is prudent for purveyors to report all known backflow incidents to DOH, including incidents where the contaminant was contained within the customer's premises. This additional information can be helpful when DOH is coordinating with the State Building Code Council on UPC issues and for demonstrating the effectiveness of premises isolation for protection of the PWS.