

**Best
Management
Practices**

Cross-Connection Control

Developed by



BCWWA

for



**BRITISH
COLUMBIA**

Ministry of Health Services

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Cross-Connection Control

Your water system—whether large or small—could be negatively impacted by cross-connections. It’s important, therefore, to understand cross-connections and to develop an appropriate cross-connection control program.

What are cross-connections?

Water systems are designed so that water flows in a designated direction through the distribution system to the consumer. However, when certain hydraulic conditions occur in an unprotected system, water flow changes direction. This occurrence is called **backflow**. Any potential or actual connection between a potable (drinking) water system and any source of pollution or contamination resulting from the backflow is considered a **cross-connection**.

Two types of backflow occur in plumbing and water distribution systems. The first is called “backsiphonage,” which occurs when pressure in the distribution system drops, thereby siphoning water from the distribution system within a building into the distribution system of the supplier. The second type of backflow is called “backpressure.” This kind of backflow occurs when a building’s distribution system pressure exceeds that of the supplier, thus water is pumped into the supplier’s system.

Cross-connection control occurs when potable water systems are protected from backflow contamination under all foreseeable circumstances.

A **cross-connection control program** includes administrative and technical procedures implemented by a water supplier to protect the potable water system from contamination via cross-connections. A cross-connection control program may be required as part of the operating permit you receive from your local health authority.

Why should BMPs be applied to cross-connection control?

BMPs, as they relate to cross-connection control, can be defined as any program, technology, process, operating method or management practice that ensures the prevention of cross-connection control or backflow. A cross-connection control program that reflects BMPs:

- **protects your potable water supply;**
- **reduces risk of waterborne illness;**
- **ensures compliance with operating permits;**
- **reduces risk and liability to water supplier;**
- **reduces number of water quality complaints;**
- **increases public confidence; and**
- **increases awareness about cross-connection control.**

A cross-connection control program that reflects BMPs also helps build consistency throughout the province.

Information Links

[CCC Background Information](#)

[CCC Educational Brochure](#)

[AWWA Educational Brochure](#)

[Household Hazards Brochure](#)

[Irrigation Hazards Brochure](#)

[Thermal Expansion Brochure](#)

[Fire Sprinkler Hazards Brochure](#)

[Council Presentation](#)

[Coordinator Job Description 1](#)

[Coordinator Job Description 2](#)

[Job Interview Questions](#)

[Regulation Bylaw 1](#)

[Regulation Bylaw 2](#)

[Regulation Bylaw 4](#)

[Regulation Bylaw 5 \(Chilliwack\)](#)

[Regulation Bylaw 6](#)

[Ticketing Bylaw 1](#)

[Ticketing Bylaw 2](#)

[Lawn Sprinkling Permit](#)

[Hydrant Use Permit \(Sample 1\)](#)

[Hydrant Use Permit \(Sample 2\)](#)

[Hydrant Use Permit \(Sample 3\)](#)

[Hydrant Refund Permit](#)

[Device Test Report 1](#)

[Device Test Report 3](#)

[Device Test Report 4](#)

[Device Test Report 5](#)

[Device Test Report 6](#)

[Backflow Incident Report Form](#)

[Data Management System](#)

What BMPs should be applied to small water systems?

Small water systems (e.g. those servicing a trailer park or subdivision) can implement a cross-connection control program that includes the following steps:

- 1) Contact the Drinking Water Officer to review program scope and potential requirements.
- 2) Research successful cross-connection control programs implemented by other small systems.
- 3) Prepare a list of all customers serviced by your water system.
- 4) Categorize customers by usage (e.g. residential, agricultural, commercial).
- 5) Review potential cross-connections for each category.
- 6) Visit each site.
- 7) Prepare a written outline of the program.
- 8) Develop a service agreement to allow enforcement of the program.
- 9) Identify potential or existing cross-connections and advise the customer.
- 10) Have customer contact a plumber certified in backflow prevention to install and test the appropriate backflow preventer.
- 11) Receive and file the contractor's test report for the device.
- 12) Test the device each year and record results.
- 13) Educate customers about cross-connections and your cross-connection control program.

If you need help...

Small Systems

- **Coastal Water Suppliers Association**
Pauline Berkman
250-338-7796
pauline@rid.bc.ca
- **Small Water Users Association**
Denny Ross-Smith
250-229-2262
smallwaterusers@shaw.ca
- **Water Supply Association of BC**
Bruce Wilson
250-765-5218
bruce@rutlandwaterworks.com

What BMPs should be applied to larger systems?

1. Conduct Initial Research

- Research successful CCC programs in other communities
- Review benefits of a CCC program for your system
- Contact the Drinking Water Officer to determine regulatory requirements
- Identify internal participants and their roles
- Identify external customers and associated risks
- Explore partnering opportunities

2. Build Program Framework

- Establish objectives and targets
- Identify manpower requirements and resources
- Identify equipment needs
- Develop budget
- Set schedule
- Prepare business plan
- Evaluate and refine plan (ongoing)

3. Garner Support & Funding

- Present business plan to senior staff and council (include regulatory requirements, liability considerations, recommended

approach, and funding requirements)

- Provide frequent updates

4. Develop Bylaw & Enforcement Strategies

- Determine penalties
- Establish definitions
- Ascertain right of entry
- Define scope of bylaw
- Perform legal review
- Establish reference supporting documents
- Develop tester requirements
- Evaluate and refine bylaw (ongoing)

5. Identify Manpower Requirements & Resources

- Determine fit in organization
- Explore staff and/or contracting options
- Determine transportation requirements
- Establish qualifications
- Define job description
- Elicit support of bylaw enforcement authorities
- Develop approved and appropriate tools
- Provide appropriate training
- Evaluate and refine manpower requirements, budgets, etc. (ongoing)

6. Develop Policies & Procedures

- Develop administrative policies and procedures (e.g. response protocols and deadlines, test reporting deadlines)
- Evaluate and refine policies and procedures (ongoing)

7. Create Communication Plan & Materials

- Identify internal and external audiences' specific communication needs
- Prepare a written plan, including emergency response procedures
- Educate all appropriate staff about cross-connection control (e.g. inspectors, bylaw enforcement officers, customer service representatives)
- Access/prepare information and education materials for external audiences (e.g. notification letters and brochures for customers, news releases for media)
- Educate external audiences (including the media) about CCC program and requirements
- Evaluate and refine plan (ongoing)

8. Develop Data Management System

- Research software options
- Identify important data to track
- Select appropriate software
- Develop test report format
- Evaluate and refine system (ongoing)

9. Access Certified Testers Registry

- See testers registry (BCWWA)
- Research and address tester liability (insurance)

10. Develop Testing Program & Reports

- List devices that require testing
- Determine testing frequency
- Set penalties for non-compliance
- Determine who can test
- Establish process for tracking tests
- Report results as required by Drinking Water Officer
- Develop customer correspondence (e.g. reminder letters, termination notices)
- Evaluate and refine program (ongoing)

11. Conduct CCC Surveys

- Establish area of responsibility (e.g. new and existing properties)
- Identify and prioritize potential contaminate concentrations and quantities
- Notify property owners of hazards and requirements for installation of backflow prevention devices
- Gather and track device histories
- Evaluate and refine surveys (ongoing)

12. Develop Incident Response Plan

- Incorporate into existing water utility emergency response plan

If you need help...

Large Systems

- **City of Burnaby**
Alex Cary
604-294-7542
carey_a@city.burnaby.bc.ca
- **City of Chilliwack**
Brendon Kurtz
604-793-2846
kurtz@chilliwack.com
- **City of Coquitlam**
Doug Dolan
604-927-3455
ddolan@coquitlam.com
- **District of Invermere**
Brian Nickurak
250-342-9281 (227)
works@invermere.net
- **City of Kelowna**
Cam Moody
250-862-5510 (242)
cmoody@city.kelowna.bc.ca
- **Township of Langley**
Wyatt Babcock
604-532-7331
wbabcock@tol.bc.ca
- **City of Victoria**
Rick Hayhurst
250-361-0339
rickh@city.victoria.bc.ca
- **Capital Regional District**
Jan Van Niekerk
250-474-9611
jvanniekerk@crd.bc.ca
- **Black Mountain Irrigation District**
Malcolm Tomlinson
250-765-5169
mtomlinson@idmail.com

Recommended Reading...

*All manuals published by the Pacific Northwest Section of the AWWA are available from the BCWWA at 604-433-4389 or www.bcwwa.org

Cross-Connection Control Manual

- **Supplement #1, Sample Letters and Record Forms**
- **Supplement #2, Sample Ordinances and Resolutions**

Pacific Northwest Section, AWWA
(503-246-5845) www.pnws-awwa.org

Cross-Connection Control Manual

Western Canada Water & Wastewater Assoc.
(877-283-2003) www.wcwwa.ca

Summary of Backflow Incidents

Pacific Northwest Section, AWWA
(503-246-5845) www.pnws-awwa.org

Backflow Incident Investigation Procedures

Pacific Northwest Section, AWWA
(503-246-5845) www.pnws-awwa.org

Manual of Cross-Connection Control

University of Southern California, Foundation for Cross-Connection Control & Hydraulic Research
(213-740-2032) www.usc.edu/dept/fccchr

Manual of Water Supply Practices, Recommended Practice for Backflow Prevention and Cross-Connection Control-AWWA M14

American Water Works Association
(303-794-7711) www.awwa.org

CAN/CSA B64.10-01 Manual for the Selection and Installation of Backflow Prevention Devices

Canadian Standards Association
(416-747-4000) www.csa.ca

CAN/CSA B64.10.1-01, Manual for the Maintenance and Field Testing of Backflow Prevention Devices

Canadian Standards Association
(416-747-4000) www.csa.ca

Standard for Double Check Valve Backflow Assembly

American Water Works Association
(303-794-7711) www.awwa.org

Cross-Connection Control Manual

U.S. Environmental Protection Agency
(202-272-0167) www.epa.gov

Standard for Reduced Pressure Backflow Prevention Assembly

American Water Works Association
(303-794-7711) www.awwa.org

B.C. Building Code, 1998, Part 7, Plumbing Services

Queen's Printer
<http://www.bcsolutions.gov.bc.ca/qp/>

Impact of Wet-Pipe Fire Sprinkler Systems on Drinking Water Quality

AWWA Research Foundation
(303-347-6100) www.awwarf.org

Professional Qualifications, Series 5000, Backflow Prevention Assemblies Standards Program

American Society of Sanitary Engineering
(440-835-3040) www.asse-plumbing.org

Drinking Water Regulations Relating to Cross-Connections

Washington State Health Department
(800-525-0127) www.doh.wa.gov

Recommended Practice for Backflow Prevention and Cross-Connection Control-M14

American Water Works Association
(303-794-7711) www.awwa.org

Interesting statistics...

In 1999, the American Backflow Prevention Association conducted a survey to determine the incidence of cross-connections and the related costs of contamination and cross-connection control. While respondents reported American experiences, the data is useful to Canadian water suppliers.

- 51% of all respondents had experienced a backflow incident.
- 42% of all cross-connection surveys found a cross-connection.
- 62% of all cross-connections are irrigation-related; other common sources are boilers, pools, tanks, spas, food equipment, fire systems, garden/wash-down hoses, carbonation systems, sewers/waste facilities, and cooling towers.
- The average annual cross-connection control cost per connection for small systems (serving fewer than 10,000 people) is \$3.40.
- The average annual cross-connection control cost per connection for large systems (serving more than 10,000 people) is \$1.28.

Based on the survey, the ABPA concluded that "public water systems should be required to have and maintain an effective on-going cross-connection control program."