



TOWN OF OXFORD

Cross Connect Control Plan

January 28, 2022

Town of Oxford
105 Lower Main Street
Oxford, NS
B0M 1P0

Attention: Ms. Linda Cloney
CAO, Town of Oxford

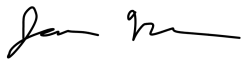
Re: Town of Oxford – Cross Connection Control Program

Dillon Consulting Limited is pleased to submit the enclosed report outlining a Cross Connection Control Program to satisfy the requirement of section 5(d) of the Town's approval to operate No. 20099-066282-01.

Please contact the undersigned with any questions or concerns.

Sincerely,

DILLON CONSULTING LIMITED



James Margaris, P.Eng.
Project Manager

JPM:mhc

cc: Public Works Supervisor
Linda Cloney

Our file: 21-2689



274 Sydney Street
Suite 100
Saint John
New Brunswick
Canada
E2L 0A8
Telephone
506.633.5000
Fax
506.633.5110

Table of Contents

Acronyms, Abbreviations, Definitions

1.0	Introduction	1
2.0	Relevant Industry Codes & Standards	1
3.0	Cross Connection Control Program	2
3.1	Program Framework.....	2
3.1.1	Program Scope.....	2
3.1.2	Overview of Authority and Power to Enforce.....	2
3.1.3	Roles and Responsibilities.....	3
3.1.4	Hazard Classification Framework.....	4
3.1.5	Survey of Facilities.....	5
3.1.6	Program Administration.....	6
3.1.7	Public Education Plan.....	6
3.2	Inspections & Testing.....	7
3.3	Backflow Incident Response Plan.....	7
3.3.1	Customer Notification.....	7
3.3.2	Identification of Source of Contamination.....	8
3.3.3	Public Health Impacts.....	8
3.3.4	Cleaning / Disinfecting the Distribution System.....	8
4.0	Implementation Plan	9
4.1	Timelines.....	9
4.2	Authority.....	9
4.3	Budget.....	10
4.4	Program Administration Documents.....	11

4.4.1 Forms..... 11

4.4.2 Letters..... 11

Figures

Figure 1: Town of Oxford’s Organizational Chart 3

Tables

Table 1: Risk Classification..... 5

Table 2: Implementation Schedule 9

Table 3: Implementation and Annual Budget Estimate 10

References



Acronyms, Abbreviations, Definitions

An abbreviation and an acronym are both shortened versions of something else. Both can often be represented as a series of letters. Many people are unable to tell the difference between an abbreviation and an acronym.

– A –

ACWWA – Atlantic Canada Water & Wastewater Association

AWWA – American Water Works Association

– B –

Backflow – the reversal of flow in the public water supply caused by either back-siphonage or back pressure.

Back Pressure – caused by a source of pressure that exceeds the public water supply pressure. This causes fluid or gas to be pushed into the water supply.

Back Siphonage – caused when a reduction in pressure results in a partial vacuum in the piping system.

BFP – Back Flow Prevention

– C –

CCC – Cross Connection Control

Cross Connection – any actual or potential connection between the public water supply and any pipe, vessel, tank, plumbing fixture, equipment or device connected to a non-potable system.

CSA – Canadian Standards Association

– I –

ICIA – Industrial, Commercial, Institutional & Agricultural

– N –

NSE – Nova Scotia Environment

1.0 Introduction

Dillon Consulting Ltd. (Dillon) has been retained by the Town of Oxford (the Town) to assist in the develop a Cross Connection Control program to satisfy condition requirements of section 5(d) of the Town's approval No. 20099-066282-01.

A cross-connection control program is one of many steps in the Multi-Barrier Approach to prevent contamination of treated water in the Town's distribution system. This program is designed to ensure that proper backflow prevention devices are installed and maintained to assure that backflow or back-siphonage of potentially hazardous substances cannot occur within the treatment and distribution system.

A cross connection control program shall ensure that backflow prevention devices are installed to isolate all facilities classified as either severe/high or moderate risk. Known as premise isolation, these devices should be installed at or near a point where a water supply enters a building or facility and before any other branch connections. The installation of Backflow Prevention Devices (BFP) are required on water service lines servicing all industrial, commercial, institutional properties and multi-unit residential buildings (greater than four units).

Backflow prevention can be achieved by an approved air gap or mechanical device. Although air gaps provide the highest degree of protection from backflow they are not always practical in some situations so a mechanical device is required. There are several types of mechanical backflow prevention devices and the selection of an appropriate device depends on the condition (back pressure and/or back – siphonage) and the severity of the health hazard present.

2.0 Relevant Industry Codes & Standards

The following list are documents related to Cross Connection Control and backflow prevention.

1. Canadian Standards Association (CSA) - CSA B64.10-11/B64.10.1.11(R2016)
2. Canadian Building Code
3. AWWA M14 – Backflow Prevention and Cross Connection Control
4. AWWA Canadian Cross Connection Control Manual
5. National Plumbing Code of Canada 2015 (NPC)

3.0 Cross Connection Control Program

3.1 Program Framework

3.1.1 Program Scope

Water utilities and regulatory authorities are concerned about cross-connections and backflow connections in plumbing systems and in public drinking water supply distribution systems. These connections, when present, have the potential to contaminate the potable water supply and could cause a significant public health event by putting customers at risk if contaminated water is consumed.

The intent of this cross-connection control program is to protect public health by ensuring the safe clean water provided by the Town is not contaminated due to backflow. This program is aimed to mitigate and eliminate any identified potential hazards due to backflow and/or cross-connections within the treatment and distribution systems by establishing policies and procedures as well as backflow preventer, selection, installation, testing and maintenance practices and procedures.

The program will track all installed testable backflow preventers connected to a water service, to ensure they remain in proper working order, and maintain a list of certified backflow preventer testers to ensure qualified persons are testing the backflow preventers.

3.1.2 Overview of Authority and Power to Enforce

The Town of Oxford owns and operates a potable water treatment and distribution system which supplies potable water to a population of over 1,200. Potable water is also supplied to a large industrial customer, a hospital, and an educational institute. There are also several commercial properties which are serviced from this system.

The first step in an effective cross connection control program is to establish the necessary legislative authority required to enforce the program. The Town of Oxford will develop a bylaw which, when passed by council, will provide the Town the necessary authority and enforcement power to successfully implement and maintain a cross connection program.

Enforcement of the program and non-compliance rests with the Town through the use of their bylaw. There are several enforcement actions which can be undertaken when a non-compliant situation is discovered. The degree to which an enforcement action is taken depends on the severity and risk associated with the non-compliance. Enforcement can be from a written warning to address the non-conformance in a reasonable time frame (minor infraction) to a water shutoff until the non-conformance is resolved (severe infraction).

3.1.3 Roles and Responsibilities

The Town's operational team will be responsible to implement and maintain the cross connection control program with administrative support provided by the town clerk or designated representative. Annual inspections of backflow prevention devices will be the responsibility of a licenced plumber or a contractor who specializes in backflow prevention and is certified in the inspecting and testing of backflow prevention devices

The following organization chart outlines the current governance of the Town's water system and who will play an active role in implementing and managing this cross connection control program. The success of this program will involve all levels of the organization having a basic understanding of the program to help facilitate public communications, budget requirements, and the Town's responsibility in developing and maintaining a cross connection control program.

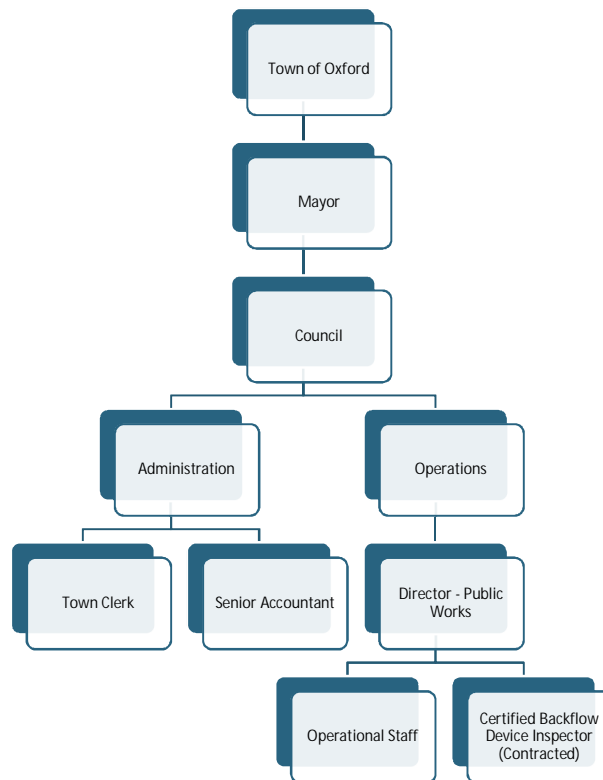


Figure 1: Town of Oxford's Organizational Chart

3.1.3.1 Responsibilities of the Town

The Town, as the operator and supplier of potable water, have the following responsibilities in relation to a cross connection control program:

- Develop public awareness and educational literature to inform stakeholders about the program and the potential hazards associated with back flow events;
- Maintain all records and documentation to support the program;

- Identify a qualified person (or company) who is certified in inspection and testing of back flow prevention devices and cross connection control prevention;
- Maintain a list of qualified back flow prevention device testers;
- Conduct a survey and hazard assessment of facilities in support of the program and to revisit assessments when conditions change;
- Assure annual (or as required) inspection and testing of back flow prevention devices.
- Develop an Incident response plan, and
- Conduct compliance monitoring and tools to enforce non-compliance

3.1.3.2 Responsibilities of the Customer

Facility / property owners have the following responsibilities as it relates to the Cross Connect Control program.

- Provide access to the Town or their designated representative for the inspection of the facility/property to determine the appropriate cross connection control measure;
- Protection of cross connections found on a property or within the facility as identified by the Town. The owner will be responsible for the purchase, installation and testing of the backflow prevention devices and assemblies;
- Provide a copy of all test results to the Town;
- Ongoing testing (usually annually) and maintenance of the unit. If a unit is found to be defective, the owner shall repair or replace the device within the timeframe set out by the Town;
- Report any known or potential back flow event immediately to the Town; and
- Inform the Town of any chemical being fed into the potable water supply within the customer's property or used on the customer's property.

3.1.4 Hazard Classification Framework

Based on Nova Scotia's "A Guide to Assist Nova Scotia Municipal Water Works Develop a Cross Connection Control Program" the following table has been developed to assist in the hazard classification of facilities. This table will be used to perform an initial desktop review of the current properties / businesses connected to the Town's water supply.

Table 1: Risk Classification

Risk Classification	Definition	Examples of Facilities
Severe/High	Any type of cross-connection or potential cross-connection involving water that has additives or substances that under any concentration can create a danger to health and is likely to result in serious injury or death	Hospitals, operating, labs, mortuary facilities, plants using radioactive materials, petroleum processing and storage facilities, chemical or plating plants, commercial laundries, sewage, automotive shops, dry cleaners, car washes, plants, food and beverage processing plants, premises where access is restricted, dockside facilities for ships, premises with sprinkle systems with glycol loops
Moderate	Any minor hazard connection that has a low probability of becoming a severe hazard.	Office buildings, multi-service interconnected facilities, schools, colleges, shopping malls, multi-tenant single service facilities, premises with sprinklers (no glycol), restaurants.
Minor	Any cross-connection or potential cross connection that constitutes only a nuisance and that results in a reduction in only aesthetic quality of water (color, odor, or taste with little to no health effects).	

3.1.5**Survey of Facilities**

A survey of facilities will be undertaken to identify those that are considered severe/high risk and moderate risk. This exercise will begin by doing a tabletop review of current facilities/ building currently connected to the Town's potable water system. Using the Hazard Classification Framework outlined above, each facility identified will be classified as minor, moderate or severe/high. It may be required to further assess these facilities for the type of hazard present to determine the type of backflow preventer required.

All Industrial, Commercial, Institutional & Agricultural (ICIA) facilities connected to the Town's distribution system will be surveyed for cross connections and documented in a survey assessment by a Cross Connection Control Inspector in conformance with CSA B64.10.

Surveys of facilities will be performed by the Town starting with the facilities with the most hazardous potential for cross connections that may pose a high degree of hazard to the potable water system. All Town owned building, parks, areas, etc. will also be included in this survey.

Any new construction or renovations affecting water service should be reviewed to ensure that cross connection hazards are identified and mitigated with an appropriate backflow prevention device.

Once the survey of facilities is complete, a map will be developed showing severe/high and moderate risk facilities to help operations identify areas of risk within the distribution system and identify key valves that may be used to respond to a backflow event.

3.1.6 Program Administration

To ensure the success of the Town's cross-connection control program, proper record keeping is a must. An electronic database (spreadsheet) will be kept and regularly maintained. Several methods can be used to keep track of backflow prevention from simple spreadsheets to commercially available cross connection control data management software packages. Due to the relatively small community of Oxford, a simple spreadsheet will be sufficient to maintain an active database.

Information and data contained within this spreadsheet (database) will include the following:

- Cross connections survey and hazard assessment results for each building / facility / property.
- Inventory of backflow prevention measures and/or devices (type, size, make, model, serial number, location)
- Inspection and testing reports
- Backflow incident reports
- Consumer information (e.g. billing address, account and meter numbers, etc.)

Standardized forms should be used in data collection to assure adequate information is collected during inspections. These forms should be submitted to the Town on a timely basis to confirm devices are tested at a minimum annually and are in good working order.

The Town's Director – Public Works will be responsible to maintain this spreadsheet and to assure all annual inspections are performed and any necessary follow-up is conducted.

3.1.7 Public Education Plan

Success of a cross connection control program depends on how the program is communicated to customers and stake holders. Raising awareness of the issues associated with cross-connections and the potential for contamination and damaging the drinking water supply and public health is critical to the success of the backflow prevention program.

Many groups should be targeted, including municipal staff, councillors, the mayor, and administrators; residents, commercial, and industrial consumers. Municipal staff, councillors, the mayor, and administrators should be educated about the drinking water system and backflow prevention program so they can communicate effectively with consumers and the public.

Awareness can happen through personal contact and presentation as well as written letters, brochures and bill stuffers to customers. Although all customers should be provided with some level of information about the program, severe/high and moderate-risk building owners need to know the

particulars of the program so they understand their level of responsibility to adhere to the program requirements and outline any next steps they need to take to become compliant.

Messaging to the public should include the following:

- Public risks associated with cross connections. This helps the customers understand the importance of the Cross Connection Control Program.
- Responsibilities of building owners to comply with the program requirements.
- Reference any guidance documents, policies, bylaws or procedures created for the public.
- Regulatory requirements and authority to enforce the program.

3.2 Inspections & Testing

All backflow prevention devices installed shall be maintained in good working order, inspected and tested by a certified tester approved by the Utility, at the expense of the Customer, and carried out annually or at other intervals as required. Devices require inspection and testing when:

- Upon installation
- When cleaned, repaired or overhauled
- When relocated
- Annually
- Following alterations to the water supply system upstream of the device
- Following a backflow incident

3.3 Backflow Incident Response Plan

This plan should be considered a supplement to the Town's Emergency Contingency Plan. Additional information on Emergency response can be found in Appendix H – Emergency Contingency Plan as part of the Town's Operation and Maintenance Manual.

A backflow incident investigation is a team effort. The Town should immediately begin a backflow investigation when a customer reports a backflow event or an event has been discovered by water quality complaints or routine testing. The lead investigator should be one who is a certified cross-connection control specialist and supported by Town staff, NSE, local health personnel and a local plumbing inspector.

The Town can use the following list of tasks as initial guidance for dealing with a backflow incident.

3.3.1 Customer Notification

1. As soon as possible, the Town will notify customers not to consume or use the water.
2. Start the notification of customers nearest in location to the assumed source of contamination.
3. Inform customers about the backflow investigation and the efforts to restore water quality. Ensure the customers know when they may use the water, the need to boil water for consumption, etc.

4. If a customer cannot be contacted immediately, place a written notice on the front door.
5. Let the customer's know that it could take several days to identify the source and type of contaminant(s) and to clean and disinfect the distribution system.

3.3.2 Identification of Source of Contamination

1. The Town should consider the distribution system as a potential source of contamination and investigate all air valves or underground structures to eliminate those potential sources.
2. Do not start a flushing program on the distribution system until the source of contamination is identified. Flushing may make the situation worse or could remove the contaminant from the system before a water sample can be obtained to identify the contaminant.
3. The Town should conduct a property-to-property survey to search for the source of contamination and the extent at which it has spread throughout the distribution system. Water meters may show a return of water (negative flow) into the distribution system.
4. When the cross connection responsible for the contamination is discovered, the Town should disconnect water service to that customer until corrective actions are completed as ordered by the Town.
5. Isolation of Contaminated Portion of System.
6. The Town will isolate the portions of the system that are suspected of being contaminated by closing valves. One valve will need to be left open to ensure that positive pressure is maintained in the isolated system.
7. The Town will notify all affected customers in the isolated area first and then notify other customers served by the system.

3.3.3 Public Health Impacts

1. The Town will immediately seek input from local health agencies to accurately communicate and properly mitigate potential health effects resulting from the backflow incident.
2. If necessary, the Town will direct customers that may have consumed contaminated water or had their internal plumbing system contaminated to public health and local plumbing inspector for further direction.

3.3.4 Cleaning / Disinfecting the Distribution System

1. The Town will develop and implement a program for cleaning the contaminated distribution system based on the contaminant(s) identified.
2. If both chemical and bacteriological contamination has occurred, the Town will disinfect the system after the removal of the chemical contaminant.
3. If bacteriological contamination has occurred, the Town will provide field disinfection as outlined in ANSI/AWWAC651-14 Disinfecting Water Mains.
4. Most chemical or physical contaminants can be flushed from the system with adequate flushing velocity. This may not occur in systems that have scale and corrosion deposits (tuberculation) which

could restrict adequate flushing velocities or where chemical deposits or biofilm are present. In this situation, the Town may need to employ a physical cleaning procedure such as foam swabs (pigs) and/or alter the chemical contaminant using oxidation with chlorination or the addition of a detergent. When using any chemical, it is important that the Town understand the chemistry of the contaminant. Seek professional guidance since adding the wrong chemical could make the contaminant more toxic or cause it to become more difficult to remove.

4.0 Implementation Plan

Based on the Cross Connection Control Plan template issued by the NSE, the following implementation plan has been developed. It is understood that the plan is dynamic and could change based on progress, changes to the implantation strategies, personnel changes, or financial constraints.

4.1 Timelines

The following timelines have been established to develop and implement this cross-connection control program. Some tasks can be done concurrently to others while some will require completion prior to moving to the next task.

Table 2: Implementation Schedule

Program Component	Timeline
Authority (by-law) development and council approval	April 30, 2022
Identify certified backflow device inspector	March 21, 2022
Facility Hazard Classification – desktop review	May 31, 2022
Survey / inspection of facilities – severe/high facilities	July 2022
Survey / inspection of facilities – moderate facilities	September 30, 2022
Program Administration:	
- Spreadsheet development and data input	July 2022
- Budget tracking	May 2022
- Supporting documentation	On-going as required
Public Education Initiative	June 30, 2022 (dependant on council approval of by-law)
Map of severe/high & moderate risk facilities	Nov 30, 2022

4.2 Authority

It is crucial to establish legal authority to ensure the cross connection control program is successful. Without authority and a mechanism to enforce it, the program may not be successful. Typically, authority is granted to the municipality through the use of a by-law. The Town of Oxford is in the process of developing the required by-law to implement and enforce a Cross Connection Control program. The bylaw will contain language that address the following:

- Cross connections are prohibited
- Backflow prevention devices must be acceptable to the owner of the water supply
- Reference to CSA/NPC standards
- Inspection, testing and reporting requirements
- Notification requirements (backflow incidents, failure in testing)
- Compliance activities and timelines
- Consequences for not adhering to the conditions outlined
- Outline water supply owner's right to access a building to conduct a survey and hazard assessment or inspect backflow prevention devices
- Certification/licensing requirements
- Responsibility of consumer regarding installation/maintenance/installation costs

4.3 Budget

A high level budget has been put together as part of the approval process to implement the program. Costs include the initial development and implementation of the program along with the annual maintenance costs to keep the program going. The table below outlines these high level cost to allow the Town to properly budget for the expenses associated with the implementation and on-going maintenance of an effective cross connection control program.

Table 3: Implementation and Annual Budget Estimate

Item	Initial Cost Estimate	Annual Operating Cost
Cross Connection Control Plan – development & submission to NSE	\$3,500	-
By-law development	\$5,000	-
Cross Connection Control Program framework	\$3,500	-
Desk-top survey – hazard classification of facilities	\$1,000	\$1,500*
Survey / Inspection of facilities by certified backflow prevention inspector	\$3,500	\$3,000
Public education and outreach initiatives	\$5,000	\$2,000
Additional supporting documents/policies/procedure/inspection reports	\$5,000	\$1,000**
Record keeping / Data management	\$4,000	\$2,000
Staff training – CCC program awareness, CCC device testing & inspection	\$2,500	\$2,500
Annual inspection of Oxford owned Back flow Preventers	-	\$2,000
TOTAL	\$33,000	\$14,000

* As required for new construction or changes to existing facilities

**As needed

4.4 Program Administration Documents

The following lists several documents the Town may consider developing and using as a means to administer their cross connection control program. There are many municipalities who have successfully developed a cross connection control program and can be a great resource to help assist in development of these documents. There are also numerous resources that can be found on the internet along with ACWWA who has a dedicated cross connection control committee.

4.4.1 Forms

The following forms can be developed and used by the Town to document activities associated with their Cross connection Control program:

- Application for Water Service (service agreement)
- Backflow Assembly Test Inspection Report
- Preliminary Hazard Assessment Form – Non-Residential Customers
- Cross Connection Control Survey Report – Non-Residential Customers
- Water use Questionnaire – Residential Customers
- Backflow incident Report Form

4.4.2 Letters

The following list of Letters can be developed and used to document actions taken by the Town to implement and maintain their program:

- Request to Complete Water Use Questionnaire
- Notice of Survey of Premises
- Request to Install Backflow Prevention Assembly
- Request to Submit Test of Backflow Prevention Assembly
- Second Notice to test Backflow Prevention Assembly

References

Guidance Document: Cross-Connection Control for Small Water Systems, Washington State Department of Health, 2004

AWWA Standard ANSI/AWWA C651-14 Disinfecting Water Mains, American Water Works Association, 2014

Backflow Prevention and Cross-Connection Control: Recommended Practices, 4ed., American Water Works Association, 2015

A guide to Assist Nova Scotia Municipal Water Works Develop a Cross Connection Control Program, Nova Scotia Department of Environment, 2020

B64.10-07/B64.10.1-07 Selection and installation of backflow preventers/Maintenance and field testing of backflow preventers, Canadian Standards Association, 2008