



# Cross Connection Control

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***Cross Connections .....***

***are they effecting your  
Water System?***

*Gander, Newfoundland  
March 26, 2003*

*Barry MacNabb  
Plumbing Inspector  
City of Fredericton*



# Topics to be discussed...

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- ***What is a Cross Connection?***
- ***Why is this an issue***
- ***What to look for***
- ***Cross Connection cases in Atlantic Canada***
- ***Hazard Classifications***
- ***Cross Connection Programs...what's needed***



# Introduction

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## What is a Cross Connection?

...any actual or potential connection between a potable water system and any source of pollution or contamination. By-pass arrangements, jumper connections, removable sections, swivel or change-over devices, or any other temporary or permanent arrangements through which backflow may occur...

Is this a Cross Connection?

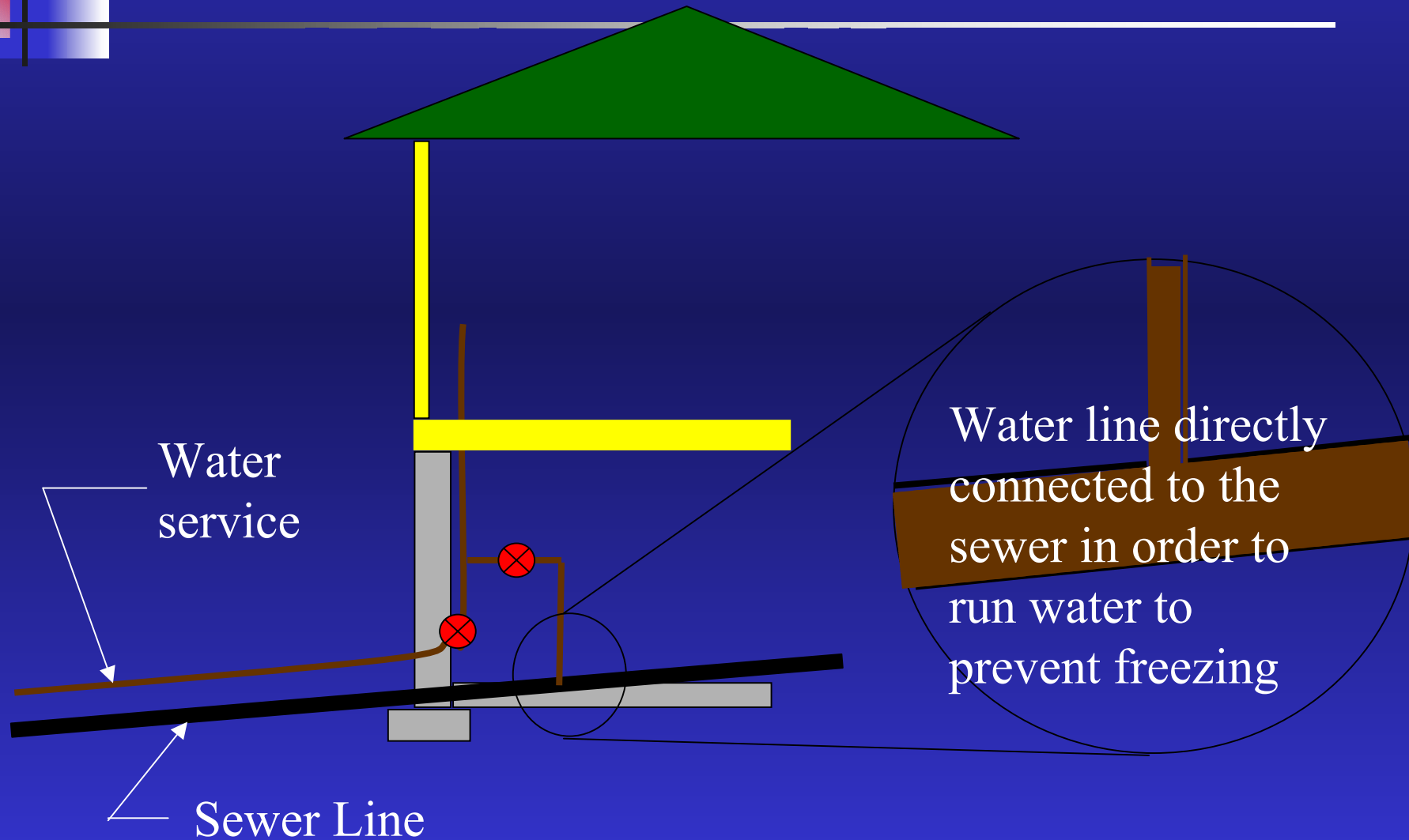
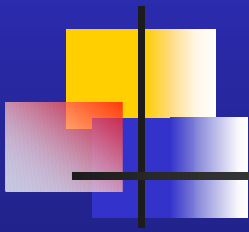








# Potential Cross-Connection







# Why is Cross Connection an issue?

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- One of the greatest risks to potable water quality.
- Puts potable water into contact with non-potable substances
- Range from invisible and harmless to deadly poisons



# **Why is Cross Connection an issue?**

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## **The result of a Cross Connection**

- May cause only a complaint about the aesthetics of the water
- Public will definitely lose confidence in your water system



# Why is Cross Connection an issue?

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- May cause severe illness
- May cause slow or quick death from poison or disease
- 40% of waterborne illness is caused by Cross Connections/line breaks

# What to look for....





# What to look for...

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**Everyone sees Cross Connections every day but in actual fact, they don't see them....**

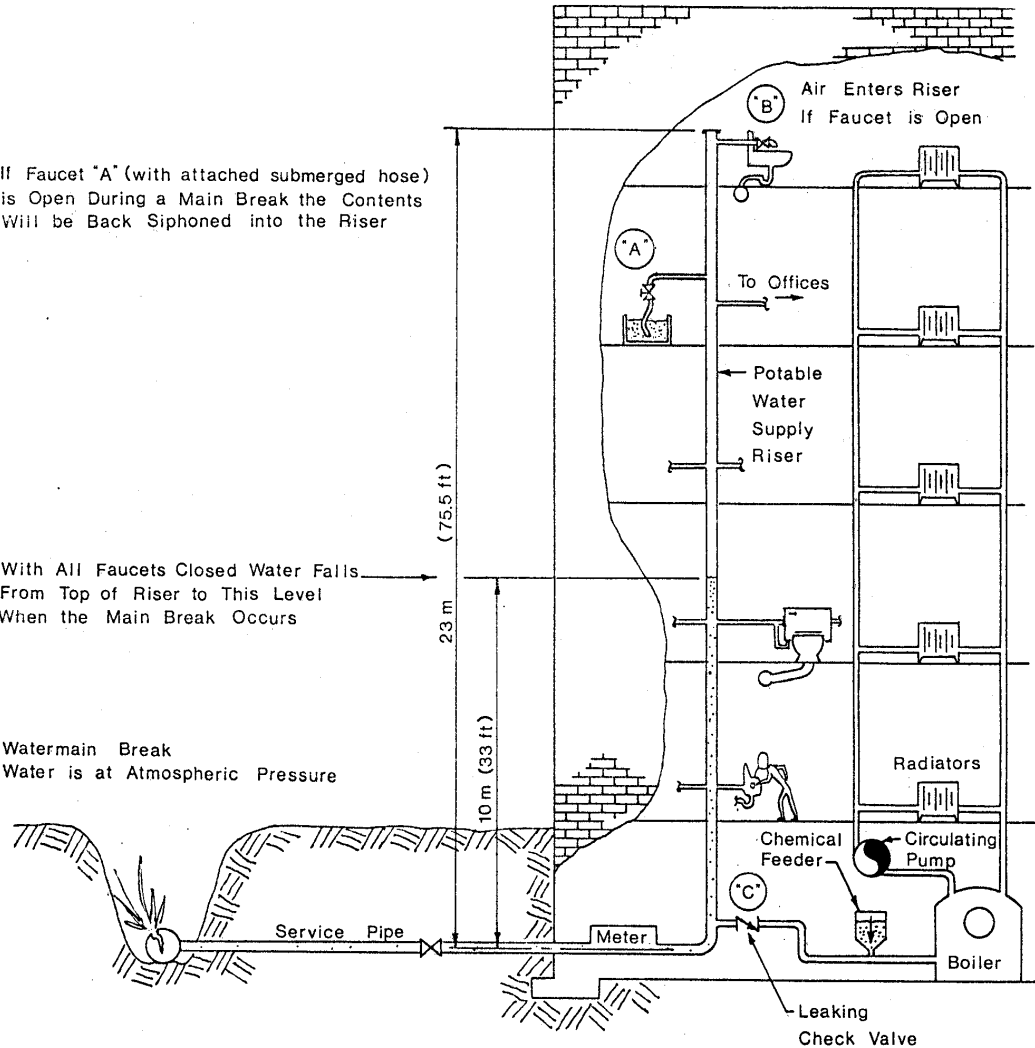
- **Hoses dangling in sinks.**
- **Dispensing units connected to water supply.**
- **Apparatus which boosts water pressure greater than supply pressure.**
- **Check everything which is water supplied.**

**ILLUSTRATION 5  
BACKFLOW DUE TO BACKPRESSURE AND BACKSIPHONAGE**

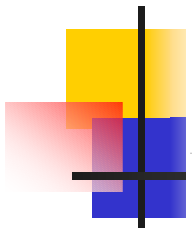
If Faucet "A" (with attached submerged hose) is Open During a Main Break the Contents Will be Back Siphoned into the Riser

With All Faucets Closed Water Falls From Top of Riser to This Level When the Main Break Occurs

Watermain Break  
Water is at Atmospheric Pressure



Back Pressure Created by the Circulating Pump and/or Boiler Could Cause Backflow During Low Pressure Periods Within the Watermain or Service





# What to look for....

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## Two types of Backflow

- **Backsiphonage**
- **Backpressure**



# Backsiphonage

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- high withdrawals
- watermain breaks
- system or plumbing shutdowns
- suction due to booster pumps











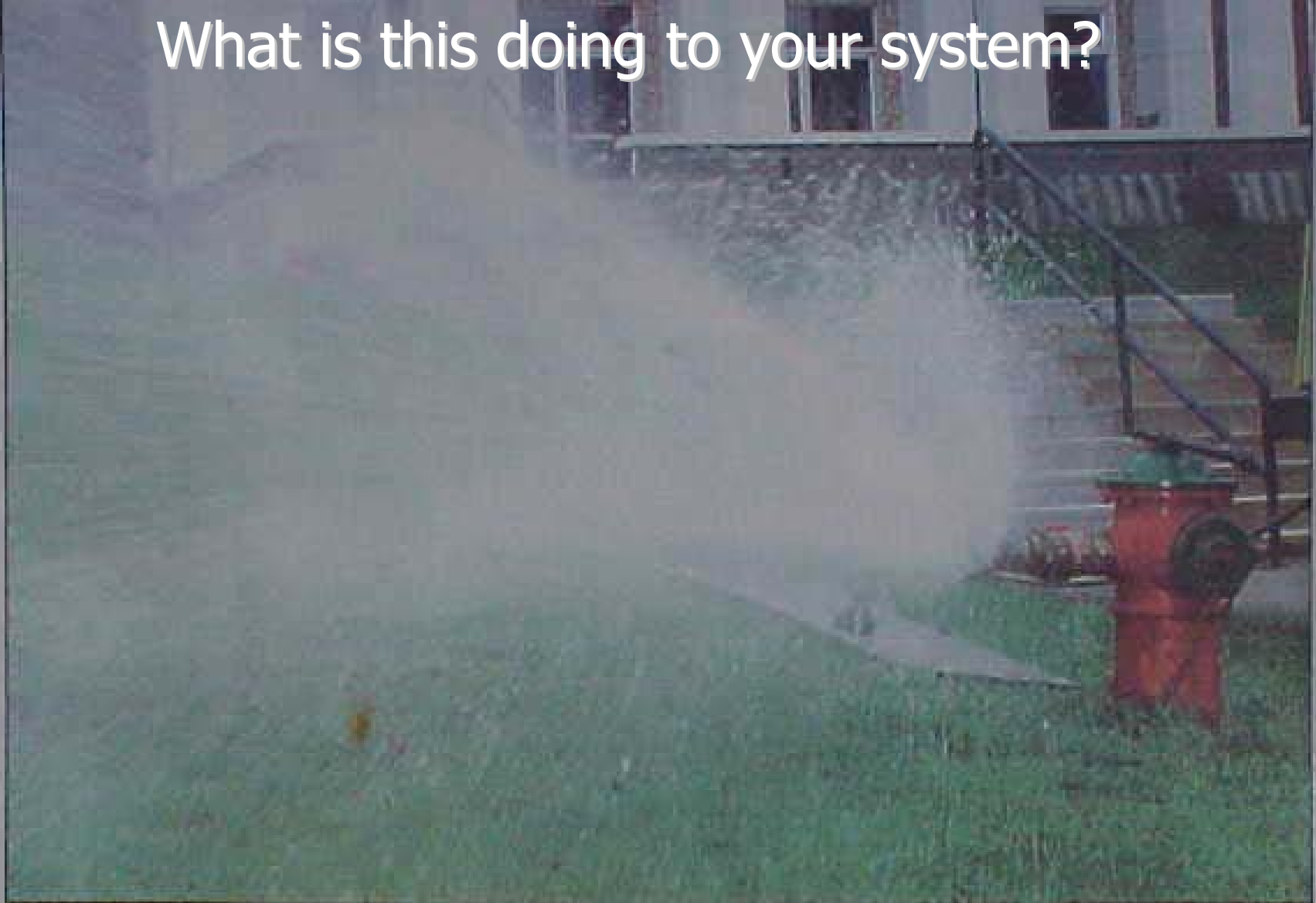


**QUAT-256**

**Strip**

**Strip**

# What is this doing to your system?



— THE DAILY GLEANER/STEPHEN MACGILLIVRAY PHOTO

**WET REPAIRS:** Several University of New Brunswick buildings including the Aitken Centre lost all power Thursday when a water

pipe burst beneath Marshall D'Avray Hall. Above, a hydrant was opened by city crews to flush the bad water from the pipes.



# Aspirator Effect



**Backsiphonage  
May Occur  
at this Point**





# Backpressure

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- **Pumps**
- **Boilers**
- **Compressed gases**





VIESMANN  
VITODENS 100

VITODENS

**Water  
Make-up  
Line**



**Direct Connection**



# **Documented Cases in Atlantic Canada**

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- Coffee Shop**
- Office Building**
- Restaurant**
- University Campus Building**



# Coffee Shop

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- Soap/Chemical Dispenser
- Coffee Machine
- Lawsuit filed.....unknown cash settlement









# Coffee Shop Conclusion

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**Loss of customer confidence in stores ability to ensure good product. Loss of confidence in the Utilities Water System.**

- **Customer settled out of court for an undisclosed amount. \$\$\$\$\$\$\$\$**
- **Owner upgraded all his shops to conform to present Plumbing Code**



# Office Building

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- **Cooling Tower and Photo Developer**
- **Building had fluctuating water pressure**
- **Faulty valve...system drained to replace valve**

**When system re-energized, contaminants entered water system and was found in water coolers, sinks and washrooms**











# **Office Building Conclusion**

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**Plumber actually initiated the Cross Connection when he drained the system down and replaced valve**

- Local Union threatened to take employer to court for possible illness of employees**
- Building vacated for three working days**
- Insurance company required that all buildings to be surveyed and Backflow Preventers installed (pollution exclusion clause)**



# Restaurant

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- **CO<sub>2</sub> pump on Post-Mix Soda Dispenser**
- **Coffee Machines on same water line**

**With no Backflow Preventer installed and the CO<sub>2</sub> pushed into copper water line to coffee machines which reacted to form**









# **Restaurant...Conclusion**

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**When CO<sub>2</sub> reacted with the copper it formed a brownish foam head on the coffee and changed the flavor to a very bitter taste**

- Department of Health ordered a complete survey of the Restaurant for Cross Connections**
- Patrons never regained confidence in the management of Restaurant and it eventually closed**



# University Campus Building

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- **Plumbing Contractor installing Backflow Preventer on domestic water service**
- **Glycol cooled compressor on a Deep Freeze condensing Unit**



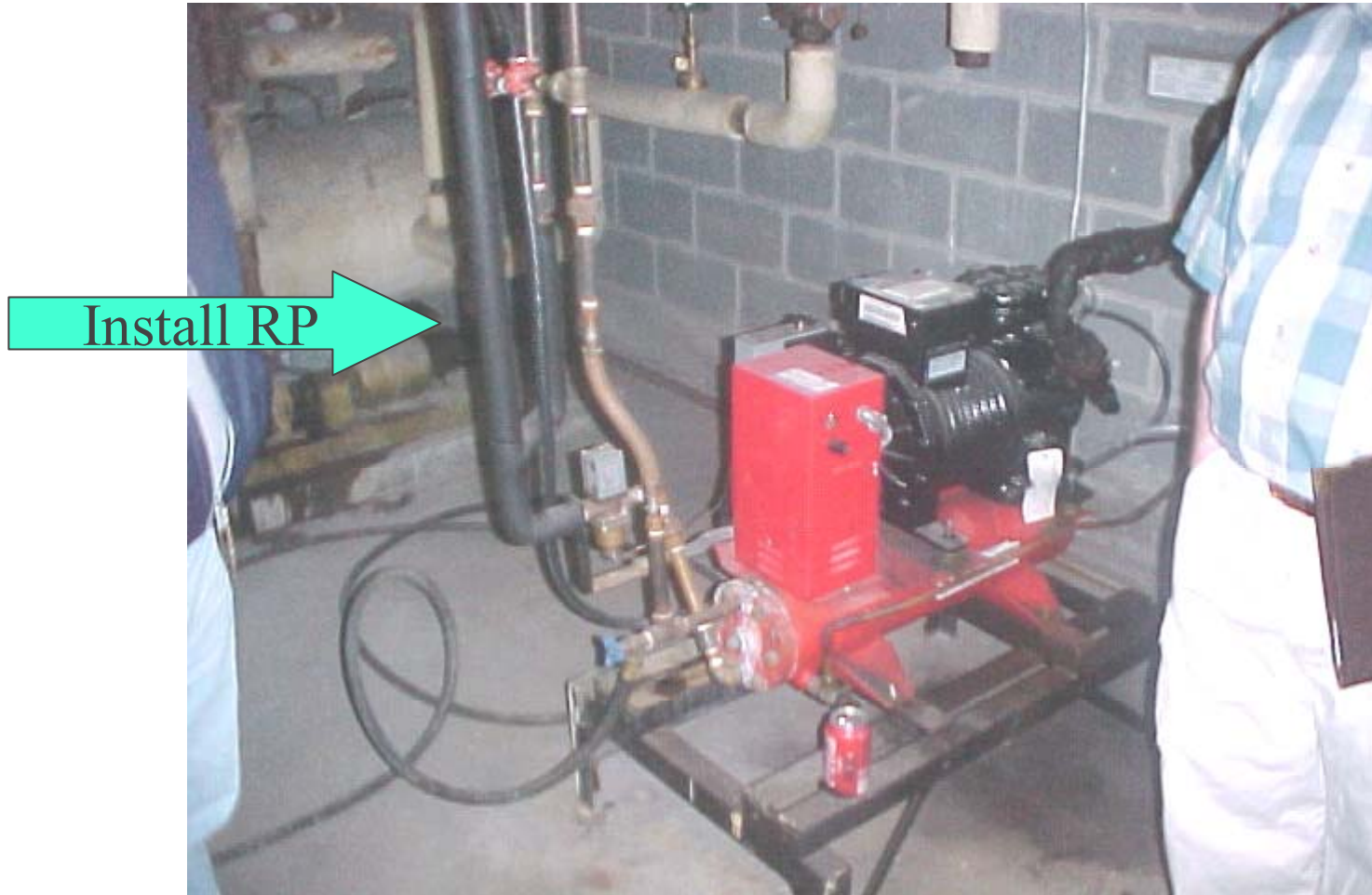


# University Campus Building

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**Plumbing Contractor drained down portion of building to install Backflow Preventer but did not check what may possibly backsiphon into the system. Completed installation and re-energized system. Didn't realize that when system drained, he allowed all the Glycol from the compressor to enter the potable water system.**





Deep freeze condensing unit with Ethylene Glycol exchanger. This unit has a direct connection to the domestic water line. **RP to be installed.**





# **University Campus Building Conclusion...**

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- **Entire Building had to be flushed and sampled for a minimum period of 48 hours until the Department of Health was satisfied the water was clear of all pollutants.**
- **All staff and students were not permitted in building until samples were clear.**
- **Building was surveyed for other Cross Connections.**

## Other Cross Connections found at Campus Building...



**Standpipe for Fire Hose Cabinets**

## Other Cross Connections found at Campus Building...



**Make-up line for cooling tower and glycol loop**

## Other Cross Connections found at Campus Building..



**Growth Chambers using water for humidification**



# Hazard Classifications

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- Minor Hazard
- Moderate Hazard
- Severe Hazard



# Minor Hazard...

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**Any cross connection or potential cross connection that constitutes only a nuisance, with no possibility of any health hazard.**

- **Cooking kettles**
- **Flexible showerheads with hose**
- **Steam tables**
- **Distillers**



# Moderate Hazard..

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**Any minor hazard that has a low probability of becoming a severe hazard....**

- **Basin or Bathtub**
- **Clothes Washer**
- **Potato Peeler**
- **Elementary School**



# Severe Hazard...

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**Any cross connection or potential cross connection involving any substance that could be a danger to health**

- **Bedpan Washer**
- **Hospital**
- **Morgue**
- **Cooling Tower**
- **Pressure Washer**
- **Boat Marina**





# **How to start a Cross Connection Control Program...**

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## **Establish Authority**

**This can be done with Provincial Legislation to provide the necessary authority to carry out the functions of the program**

NEW BRUNSWICK

REGULATION 84-187

under the

PLUMBING INSTALLATION AND INSPECTION ACT

(O.C. 84-619)

*Filed*

*the Plumbing Installation and Inspection Act, the Lieutenant-Governor in Council makes*

*may be cited as the Plumbing Licensing and Inspection Regulation - Plumbing Installation*



# Prepare a By-Law

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**Generally integrated into the Water and Sewer By-Law, as the Utility is the body who will be administering the Program. Within By-Law, it must be determined who is responsible for the installation, maintenance and testing costs of the Backflow Preventers. Generally becomes the responsibility of the owner of the premises.**



# Put teeth in your By-Law

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**...No owner or other person shall connect, cause to be connected, or allow to remain connected, any piping, fixture, fitting, container, or appliance in a manner which, under any circumstance, could allow water, waste water, or any other substance to enter the Municipal Water System.**



# Put teeth in your By-Law

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**...if a condition is found to exist, which in the opinion of the Director of Engineering and Public Works is contrary to subsection (1) hereof, the Director may either shut off the service or services, or give notice to the customer to correct the fault within a specified period...**



# **Other crucial sections to By-Law**

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- Criteria for testing**
- Criteria for Licensing Certified Testers**
- Enforcement**
- Installation Requirements**
- Criteria for Maintenance and Repair**
- Reference documents used to select, install and test Backflow Preventers**



# **Documents needed**

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## **Documents to be utilized and referenced**

- **CSA B64.10-01, CSA B64.10-01.1-Standard for the Selection, Installation, Maintenance and Field Testing of Backflow Preventers**
- **National Plumbing Code of Canada, Latest Edition**

B. MacNABB.

City of Fresno

B64.10-01/B64.10.1-01  
**Manual for the Selection  
and Installation of  
Backflow Prevention  
Devices/Manual for the  
Maintenance and Field  
Testing of Backflow  
Prevention Devices**







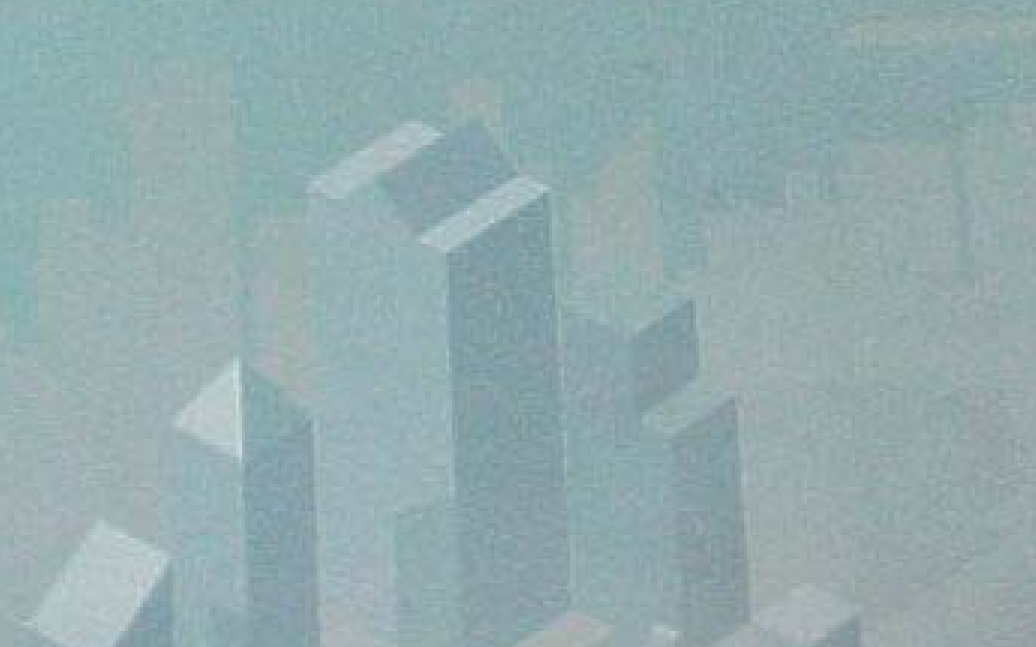
National Research  
Council of Canada

Conseil national  
de recherches en sciences

**NRCC-CNRC**

**National Plumbing Code  
of Canada  
1995**

Canadian Commission on Building and Fire Codes





# Staff Training

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- **Have both inside and outside staff trained by an accredited Cross Connection Control facility (A.W.W.A. or A.C.W.W.A.)**
- **Courses range from Awareness, Testers to Surveyors**
- **Gives staff the knowledge and credibility to properly manage and maintain a Cross Connection program**



# **Have all Premises Surveyed**

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**All buildings that are connected to your distribution system. Using the CSA Standard and the National Plumbing Code you can determine what is required for Premise, Zone, and Point of Use protection.**

**Have devices installed and tested which would complete the first step in your program.**

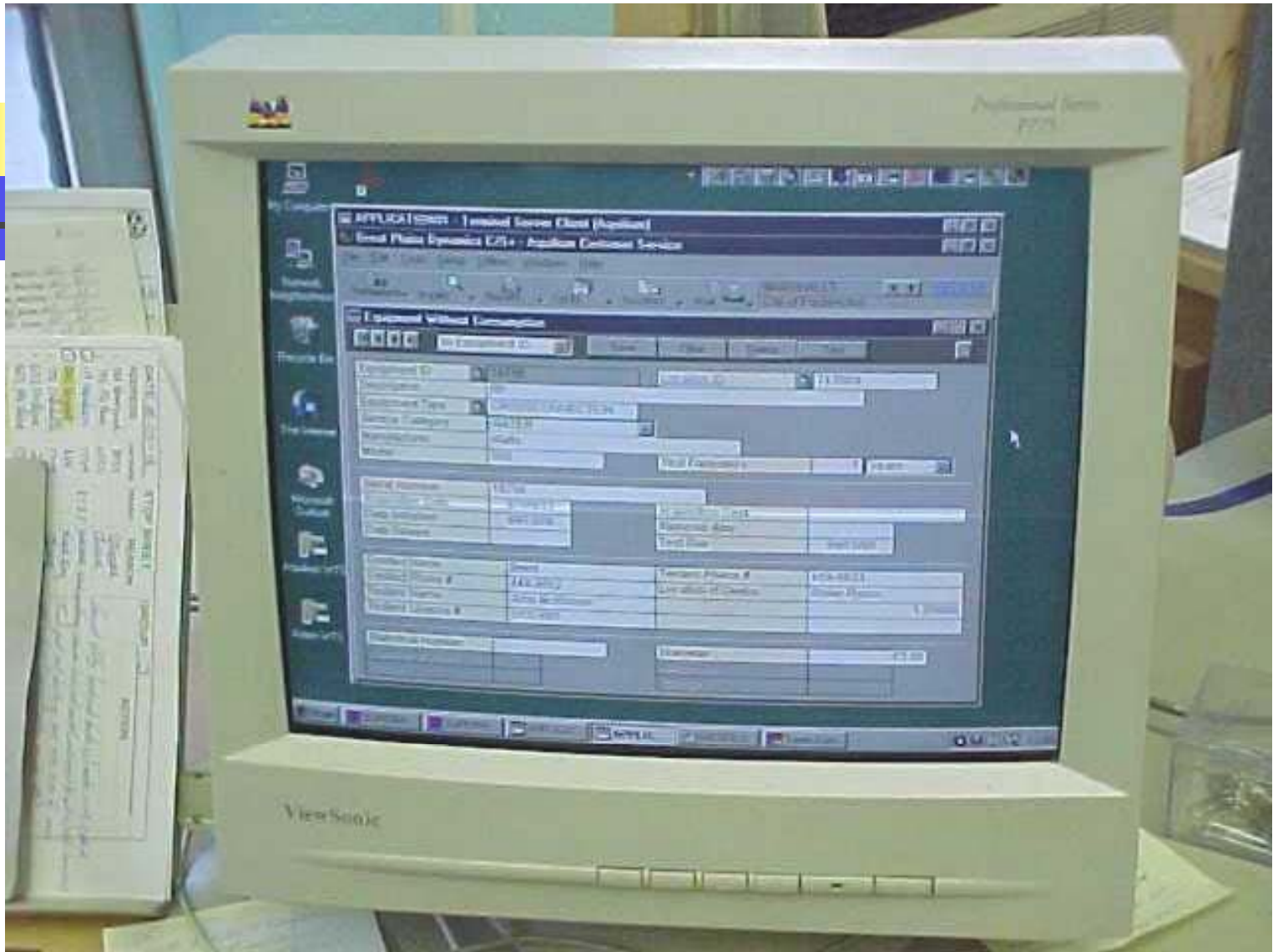




# Catalogue the Devices

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**To manage the testing requirements for Backflow Preventers installed throughout your Distribution System, you can manually record, customize your current computer system or purchase a program which will assist you in notifying owners when devices must be tested.(The CSA Standard states, testable Backflow Preventers must be tested at least annually by a Certified Tester.**



Professional Series  
7775

APPLICATION - Terminal Server Client (Application) [X] [O]  
Great Plains Dynamics, L.P. - Application Container Service [X] [O]

File Edit View Help

Equipment Without Connection [X] [O]

Equipment ID: [text field]    Equipment ID: [text field]

Equipment Type: [text field]

Equipment Category: [text field]

Manufacturer: [text field]

Model: [text field]

Equipment Location: [text field]

Equipment Status: [text field]

Equipment Description: [text field]

Equipment Serial #: [text field]

Equipment Barcode #: [text field]

Equipment Purchase Date: [text field]

Equipment Purchase Price: [text field]

Equipment Depreciation: [text field]

Equipment Useful Life: [text field]

Equipment Current Value: [text field]

Equipment Original Value: [text field]

Equipment Depreciation Method: [text field]

Equipment Depreciation Rate: [text field]

Equipment Depreciation Period: [text field]

Equipment Depreciation Start Date: [text field]

Equipment Depreciation End Date: [text field]

Equipment Depreciation Status: [text field]

Equipment Depreciation Calculation: [text field]

Equipment Depreciation Summary: [text field]

Equipment Depreciation Details: [text field]

Equipment Depreciation History: [text field]

Equipment Depreciation Settings: [text field]

Equipment Depreciation Help: [text field]

Equipment Depreciation About: [text field]

Equipment Depreciation Exit: [text field]

Equipment Depreciation Refresh: [text field]

Equipment Depreciation Print: [text field]

Equipment Depreciation Save: [text field]

Equipment Depreciation Cancel: [text field]

Equipment Depreciation OK: [text field]

Equipment Depreciation Close: [text field]

Equipment Depreciation Help: [text field]

Equipment Depreciation About: [text field]

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Equipment Depreciation Refresh: [text field]

Equipment Depreciation Print: [text field]

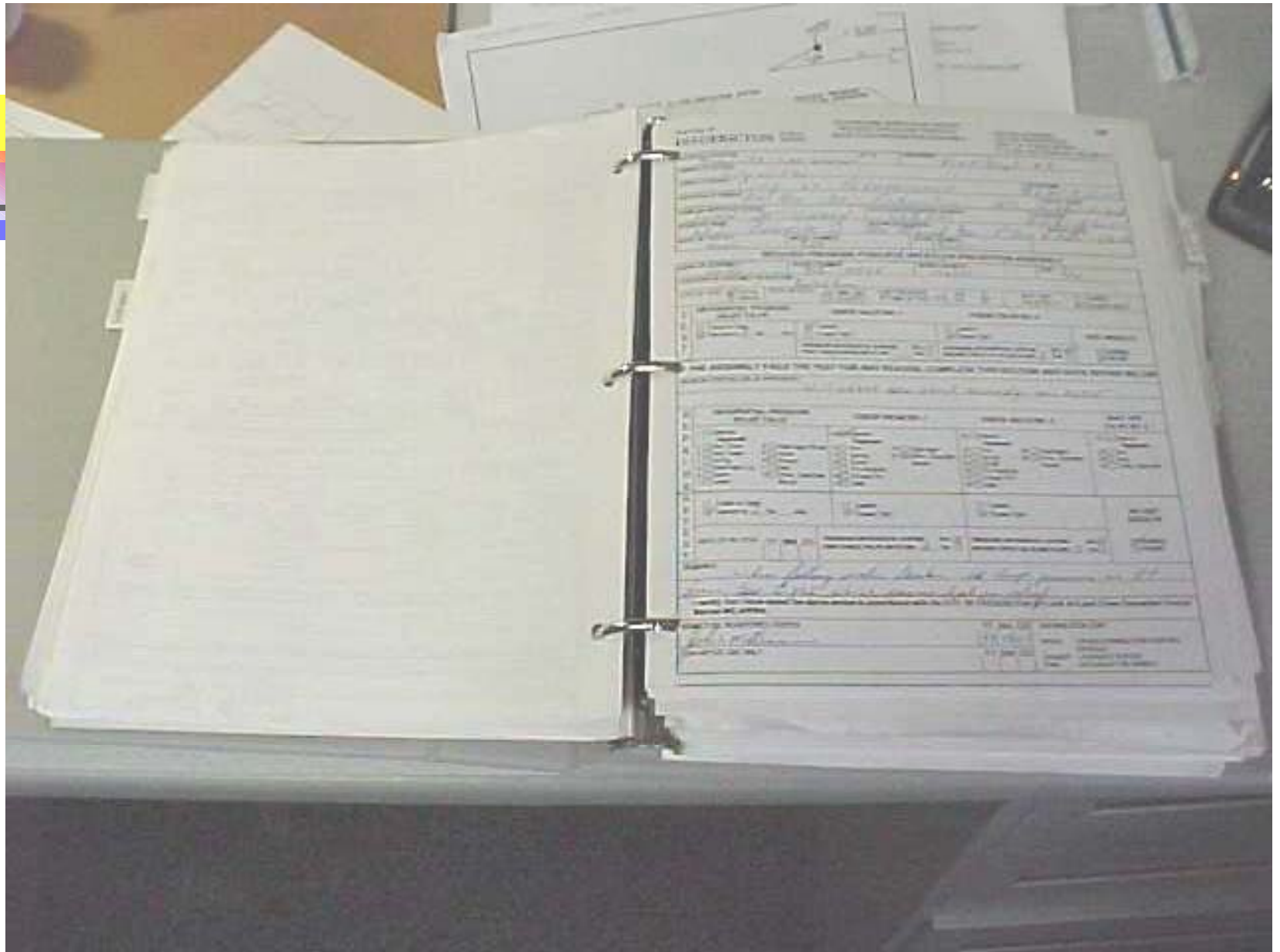
Equipment Depreciation Save: [text field]

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Equipment Depreciation Close: [text field]

ViewSonic





# **Sample Long Range Plan**

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- **Legislation**
- **By-Law**
- **Staff Training**

**Public Education Program (continuous)**





# **Sample Long Range Plan Continued...**

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- **Survey Buildings for Premise Isolation (domestic)**
- **Survey and retrofit Municipal Buildings**
- **Develop retrofit Strategy for Private Sector**
- **Contact and enforce Severe Hazard Building Owners**
- **Contact and enforce Moderate Hazard Building Owners**
- **Contact and enforce Minor Hazard Building Owners**
- **New building enforcement (continuous)**
- **Begin retrofitting Sprinkler Systems on all buildings**
- **Enforce annual testing of Backflow Preventers**



# **Long Range Plan Conclusion**

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**This sample plan has an estimated activity timeline of approximately 6 years.**

**The order in which it is written is from Municipalities which have an active Cross Connection Control Program, but some of the items listed can be changed around to suit any water purveyors needs.**



# Protection?

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- **Protect the Public**
- **Protect your investment**



# Something to think about...

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**A Cross Connection Program provides the necessary completeness to a Water Quality Plan. It fits in beside Source protection, Treatment, Distribution System Maintenance and Monitoring.**



**The End**

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**Questions?**