Cross-Connection Control and Backflow Prevention for Public Water Systems

Focus On Change
2018
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For more than 100 years cross-connection has been discussed by water and health officials.

One of the first papers on record concerning cross-connections was presented initially in 1894.

Soon after, a committee was appointed to investigate cross-connection issues.

After filing the report in 1928 regarding the investigation, the committee defined the word ‘cross-connection’.
• Cross-Connection was defined as a connection between the distribution system of a public or private drinking water supply and a private or secondary non-drinking water supply.

• The definition was adequate since the foundation of a cross-connection control program in the early 1900s originated from fire insurance companies and from property owners who desired two sources of water, rather than one for greater protection against fire.
History

- The final report detailed the overall issues caused by cross-connections, auxiliary intakes and bypasses.
- The tabulation included a total of more than 11,000 cases of dysentery and 226 deaths.

- *AWWA Journal, Backflow Prevention and Cross Connection Control, June 1970*
Need To Know

• Cross-Connection is the point where a non-drinking water source can be connected to a drinking water source within distribution systems.

• Rules and regulations developed to reduce or eliminate the possibility of health risks.

• City and County ordinances developed according to the rules and regulations.
• Department of Environmental Protection (DEP) has had Cross-Connection Control (CCC) Rules for Public Water Systems (PWS) since 11/9/1977.

• DEP CCC rules relied on reference to *Recommended Practice for Backflow Prevention and Cross-Connection Control: AWWA Manual M14*.

• DEP amended the CCC Rules on 1/3/91 to allow Dual Check Devices (DuC) to be used as backflow protection at Residential Service Connections (SC) to premises with a Reclaimed Water System.

A CCC Program is an effort to establish guidelines for controlling cross-connections and ensure the enforcement of the guidelines to protect the public drinking water supply.

The responsible Community Water System (CWS) determines the most effective backflow prevention measures to correspond with the degree of hazard.

The customer must prevent the possibility of contamination by their private plumbing system as well.
Prevention of backflow must be well-thought out plan to reduce or eliminate issues due to cross-connection within the water system.
Backflow

• Backflow is the reversal flow of possible harmful fluids (contaminants) into a drinking water system due to cross-connection.

• Bypass Arrangements such as jumper connections, removable sections of watermain, or any other temporary or permanent device can cause backflow of contaminants.
Backflow

• Backflow occurs for two reasons, **back pressure** or **back siphonage**.

• Back pressure occurs when there is a higher pressure in the water system than in its water supply (system pressure has been raised by particular means).

• Back siphonage occurs as a result of the water supply pressure being lowered below the water system pressure.
**Backflow**

**Event 1** Water pressure is reduced because of a break in the water main.

**Event 2** Reverse pressure is created by a drop in water pressure. Dangerous chemicals can then be drawn into the drinking water supply through a hose (also known as a cross connection).

**Event 3** Dangerous chemicals enter the drinking water supply and come out of neighbouring showers and taps. This can cause serious or fatal injury.
• Compromised water quality can lead to public health risks.

• Contaminants can cause low to high risks when associated with cross-connections and backflow of fluids.

• The level of protection should correspond with the type of risk.
Public Health Risks

• **Low – Moderate Risks** are hazards involving a substance that if introduced into the water supply would not cause considerable risk to the public.
  - Beverage bottling plants

• **High Risks** are hazards involving substances that if introduced into the water supply could potentially cause illness or death.
  - Hospital
  - Car wash
  - Food processing plants
• Prevention helps to ensure the safety of customers, and provides safe drinking water.

• Backflow Prevention (BP) uses devices that will inhibit the possibility of harmful fluids to backflow into the drinking water system from another source.

• The type of facility determines the type of backflow prevention device that should be implemented.
• Protection for the typical temperature of the environment (warm or cold climate)
• Cannot be installed in an area prone to flooding
• Ground clearance must be considered before installation
• Water lines must be flushed thoroughly prior to installation
Backflow Devices

- Double Check Device
- Reduced Pressure Device
- Dual Check Device
- Pressure Vacuum Breaker
- Atmospheric Vacuum Breaker
Backflow Devices

• Approved Reduced Pressure Principle Assemblies (RP) and Double Check Assemblies (DC) may be used depending on the level of risk for the drinking water system.

• RP incorporates two independently-acting spring-loaded check valves separated by a spring-loaded differential pressure relief valve, two seated shutoff valves, and four test cocks.

  ▪ When operating normally, the area between the two check valves is maintained at a lower pressure than the supply pressure, and discharge small volumes of water due to the fluctuation in line pressure.
Backflow Devices

• RP devices must have an air gap (AG) located next to the relief valve opening, or direct fluid flow away from the device in order to protect against low to high health risks.

  ▪ AG required at or for service connections conveying water to a tank or waste discharges; provides maximum protection if not altered and must be available for inspections.
Backflow Devices

• DC devices incorporate two single-check valves assembled within one body with four test cocks and two shut-off valves.
  ▪ Devices must be installed in facilities that handle substances under constant pressure that may cause low to moderate health risks.

• Dual Check Devices (DuC) may only be used if there is no known cross-connection between the plumbing of a customer’s property, and a secondary water source such as a reclaimed water system.
Atmospheric Vacuum Breaker (AVB) vs. Pressure Vacuum Breaker (PVB)

• AVB devices prevent backflow of non-potable liquids into the drinking water system; however, the device does not allow for testing after it has been installed, nor does it allow the ability to locate any back pressure sources (not acceptable).

• PVB devices prevent the reversal flow of fluid into the drinking water system as well, evolving beyond the AVB device in order to allow the device to be operational under constant pressure, and with the ability to be tested (acceptable).
Backflow Devices

• Cross-connections and backflow protection within the distribution system between facilities are described on pages 80-84 in the AWWA Manual M14 and Subsection 62-555.360(1), F.A.C.

• Images below show BP devices needed between drinking water systems.

NTNCWS = Non-Transient Non-Community Water System
TNCWS = Transient, Non-Community Water System
All backflow devices require testing and maintenance on a regular basis for proper operation by certified or licensed inspector, or plumber.

Testing and maintenance are referenced in the rules and regulations of the state (62-555.360, F.A.C.), city or county ordinances, or the manufacturer’s procedures of the device.
Devices required for non-residential areas must be tested after installation, repair and at least annually.

Devices required for residential areas must be tested after installation, repair and at least biennially.

Dual Check devices needing to be refurbished or replaced in residential areas must be on a 5-10 year schedule, or lesser frequency determined by the CWS.
Enforcement

• City or County governments can determine, according to their ordinances, what type of actions to enforce.

• If for any reason a water system cannot comply with the requirements for eliminating or reducing a backflow hazard or cross-connection, a request for an extension may be considered depending on the City or County ordinance.

  ▪ The request must be accompanied by appropriate documentation identifying the steps to be taken by the water system in order to make the necessary corrections.
Enforcement

• If an unprotected cross-connection is discovered, water systems should ensure cross-connection is eliminated and appropriate backflow protection is provided at the service connections, or water service must be discontinued.

• In a case where there has not been any backflow prevention devices installed, the system must install an approved device depending on the type of facility.
Cross-Connection Reports

• Each CWS serving more than 10,000 persons must prepare and submit CCC program annual reports.

• The first report must be the current calendar year; subsequent reports must cover each calendar year thereafter.

• The reports must be prepared using Form 62-555.360(13) in Rule 62-555.360, F.A.C., and submitted to the appropriate District or Approved County Health Department (ACHD) within 3 months after the end of calendar year covered in the report.
Education

• Education is important when it comes to cross-connection.

• The city or county may require operators or technicians to complete training for certification.

• Trained and certified operators can contribute effectively to CCC and backflow prevention.

• Many CCC Programs could involve customers to learn the dangers of backflow and effective actions to prevent cross-connections.
Cross-Connection Cases

“A CCC Program is like an insurance policy: You hope you never have to use it, but you’re glad it’s there when something out of your control happens”...AWWA, In the Field: Cross-Connection Control is Everyone’s Responsibility, November 2014.

Cases involving Cross-Connection:

• Garden hose connected to residence and open end placed in bucket of unknown fluid.
Cases involving Cross-Connection:

• Employee health problems from cross-connection within an office building with a 10,000 gallon hot water tank for heat storage, due to pressure increase.

• City in Florida unaware of three-month cross-connection issue in single-family residence that was connected to drinking water system as well as a reuse water system.
Presentation Summary

• CCC and Backflow Prevention is a necessity in water quality

• Establish CCC Programs according to risks that may contribute to backflow within plumbing system

• Education is key to control the risks of cross-connection

• Know your City or County ordinances

• View or download current FAC Rule 62-555.360, including Form 62-555.900(13), at following Florida Department of State webpage:

Questions and Comments
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