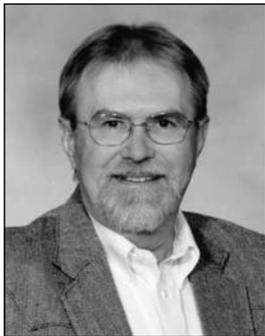


Backflow protection: how well is your water system protected?

Backflow protection from cross connections or potential cross connections has long been a critical issue for public water systems and the customers they serve. Public water supply systems can be contaminated from pollutants and toxins that enter the water system through poor or improper plumbing practices. A cross connection can be defined as a direct or indirect connection between the potable (safe to consume) public water supply and any source or potential source of contamination. Even though your system may have an excellent cross connection control ordinance and a good working program, how well is your water system and water quality really protected?



*Randy Johnson
Training Director*

Contamination of the public drinking water can develop if a contaminant is allowed to backflow into the water distribution system. Backflow can be caused by either backpressure or backsiphonage. For backflow to happen conditions have to be in place. For one, a cross connection has to exist and second, the water system pressure has to drop to an unsafe level. Common causes for system pressure drops include water main breaks, power or pump outages and heavy system demand, such as the demand created during a fire fighting event. Maintaining positive water system pressure isn't a 100% guarantee against backflow. All public water systems

are required to maintain at least 20 psi (pounds per square inch) throughout the water distribution system during all normal water demand situations, which includes fire fighting, if your system is

systems will sooner or later experience low water system pressure from one of the above mentioned causes. Therefore it becomes imperative that water systems eliminate or control all

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designed to provide fire protection. If a cross connection exists where the backpressure is greater than the water system pressure, then backflow can still occur, even if the water system pressure exceeds the minimum 20 psi requirement. Even the best managed and operated water

existing and potential cross connections.

All municipalities (who operate public water systems) and rural water districts should have adopted ordinances, rules or regulations to govern the control of cross connections on their

systems. If your system needs to establish an ordinance or wants to look at upgrading your ordinance, a model ordinance is available from KRWA and our staff is available to assist you with this process. Once an appropriate ordinance is in place the task of backflow prevention has just begun. Water systems need to identify customers that pose any risk to water quality and public health. Those customers then need to be categorized as to

The typical customers that are going to be categorized as to hazard levels are businesses, industries and institutions.

Following is a list of types of customers that should be inspected by water system staff to determine if cross connections or potential cross connections exist:

- chemical plants
- manufacturing plants
- food processing plants
- bottling plants
- hospitals
- nursing homes
- golf courses
- wastewater facilities
- water treatment plants
- car washes
- power generating plants
- medical clinics
- boiler systems
- cooling towers
- bulk water sales stations
- sprinkler systems
- swimming pools
- beauty salons
- dentist offices
- veterinary clinics
- private wells
- laboratories
- laundries/
dry cleaners
- mortuaries



Left: The main water supply line to an industry without a backflow prevention device.

Right: The main water supply line to the same industry, now equipped with parallel RPZ devices.



whether they pose a high level of hazard (a health hazard to water consumers) or a lower level of hazard (an aesthetic or disagreeable hazard to water consumers but not health threatening). The level of hazard will determine the level and type of protection that will be required to control or eliminate the cross connection.

A case can be made that all customers are potential cross

connection threats. Some water utilities have required the installation of check valves on all customer service lines, believing that the check valves would prevent backflow from any customer's system. That strategy offers a false sense of security, in that single check valves can easily fail due to becoming fouled with sediment or debris. All backflow prevention control measures (both devices and air gaps) must be inspected and tested annually. The single check valves cannot be tested in-place. The customer's service has to be shut off and the valve removed from service to be properly tested. This is a time consuming and therefore expensive process that most water utilities are not willing to perform.

In addition to the initial inspection (see the sidebar list on the previous page) of the water customer's plumbing system, water purveyors are responsible for determining what specific action will be required by the customer to control or eliminate the cross connection. The water purveyor is also responsible for establishing a system that tracks the required annual inspection and testing of all backflow prevention devices



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Left: The water supply to the fire protection system serving an industry.
Right: A DCV installed on the water line providing service to fire protection system.

nineteen cross connections were witnessed. The industry was notified of the findings with a written report and with photos of the deficiencies in their plumbing system. Through cooperation with the industry the situation is now properly controlled. A follow-up inspection revealed that the City's water system is protected by the installation of two reduced pressure zone (RPZ) principle devices on the plant's main water supply line. Parallel devices were installed to maintain water supply to the plant during times of device testing and maintenance activities. In addition the industry re-plumbed their facility separating the water supply to all potable water stations (drinking fountains, kitchen and break areas, restrooms, etc.). That line is also protected with an RPZ device. The fire protection system for the

and physical air gaps. KRWA staff are also available to provide assistance to water department staffs with how to conduct an initial inspection and how to establish and maintain a good working cross connection control program.

Recently KRWA staff accompanied the water department staff of a municipality in the performance of an initial inspection of a manufacturing plant. During the inspection



industry is now also protected with a proper, testable double-check valve (DCV) assembly. The city and the industry should both be commended for their efforts in taking positive action to protect the city's water supply and the water supply for employees at the industry

In regard to residential customers we rely on public education and the manufacture and use of modern plumbing fixtures, appliances and practices. The employment of qualified, professional plumbers has helped significantly to reduce the existence of many real and potential residential cross connections. Modern plumbing fixtures and appliances are designed with backflow protection built into the devices. Bathtubs, sinks, showers, automatic washers, dishwashers and icemakers should all be designed with physical air gaps in place to prevent backflow. A physical air gap is defined as a physical separation of the end of the water line (the faucet or outlet) and the end of the sewer line (the overflow rim of the device). A physical air gap must be a distance of at least two times the outlet diameter (example: a one inch outlet/opening would require a two inch air gap) or a minimum one inch air gap for all outlets (example: a 1/4 inch outlet would

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Left: A hose connected to a water line without a backflow prevention device.
Right: A hose bib equipped with an atmospheric vacuum breaker.



against backsiphonage but not backpressure.

Kansas Rural Water Association remains committed to providing the highest quality of training and technical assistance in dealing with cross connections and backflow protection issues. The annual inspection and testing of backflow prevention devices must be performed by qualified personnel. KRWA offers full five day (40 hour) training courses for the certification of qualified backflow device testers. The courses are designed to train water system personnel as well as device testers. This is comprehensive training that includes the backflow device tester certification exam at the end of the training course. The schedule for upcoming KRWA cross connection courses is listed below and additional course information is available on the association Web site, www.krwa.net.

require a one inch air gap). The greatest threat that exists to compromise air gaps is the installation or use of a hose on the faucet or outlet, there by extending the water line to a point below the overflow or flood rim of the vessel. Another real threat is the use of garden hoses. The application of lawn and garden chemicals (through an aspirator) and in general the extension of the water line with hoses poses both real and potential cross connections. Many potential cross connections can be protected with hose bib atmospheric vacuum breakers. They provide protection

Planned Backflow Training Sessions

You may register online for KRWA training. Below are upcoming dates and locations. For more information call the Association at 785/ 336-3760.

- October 24-28, 2005 in Hays
- November 14-18, 2005 in Topeka
- December 12-16, 2005 in New Century (near Olathe and Gardner)
- January 9-13, 2006 in Lawrence

KRWA Training Director Randy Johnson teaches the water/wastewater math class held in Marysville on September 23 and 24. This class provided attendees with a good refresher on many math problems most systems have to deal with – not always on a daily basis.

