



Massachusetts Department of Environmental Protection
Division of Water Supply
One Winter Street
Boston, Massachusetts 02108-4746

gauge downstream of a spring-loaded, soft-seated check valve that was installed vertically between the fire suppression and drinking water lines.

During the search for what was causing the tainted water, investigators discovered that the static pressure within the fire suppression system serving the restrooms and drinking fountain area in the visitor's center was nearly equal to that in the potable water system. Pressure within the other two fire suppression lines was much higher. An engineering firm advised arboretum management that the lower pressure in the first sprinkler system could be causing a very serious backflow problem. Acting on that firm's advice, the museum had both the pressure gauge and the check valve removed and replaced with an RP backflow preventer.

An examination of the check valve revealed that it had been the culprit. Some foreign material – two small pieces of rubber gasket – had gummed up the works and prevented the valve from working properly. Because problems with all types of check valves are very common, the Massachusetts backflow preventer testing program is geared toward identifying potential equipment failures before they happen.

What are the regulations governing cross connections?

The Massachusetts Plumbing Code (248 CMR 2.14) and Massachusetts Drinking Water Regulations (310 CMR 22.22) both require the installation of backflow preventers at all cross connections. Several types of devices are available: reduced pressure backflow preventers (RPs), double check valve assemblies (DCVAs), air gap separations with tank and pump arrangements, atmospheric vacuum breakers (AVBs), pressure vacuum breakers (PVBs), and barometric loops. The type of device that is

appropriate for your application depends on the degree of hazard associated with the particular cross connection. All backflow preventers require a local plumbing permit. Some devices – RPs, DCVAs and air gaps – also must be approved by DEP or its designee before they are installed. The DEP permit must be renewed every year.

State regulations also require periodic testing of RPs, air gaps, and DCVAs to ensure that they are continuing to work properly. RPs and air gaps must be tested twice annually by the water supplier and once a year by an independent certified backflow prevention device tester hired by the owner. DCVAs must be tested annually by the water supplier.

What is the cost of providing adequate cross connection protection?

The typical cost of a device on an industrial process line is \$300 to \$400 depending on the size and type, as well as the plumbing configuration and water pressure within the building. Since a backflow preventer may be the only barrier between your employees or customers and contaminated water, your investment in installing and maintaining the equipment is minimal when compared to your potential liability for a backflow incident.

Where can I go for more information?

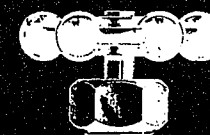
Please contact the DEP, Division of Water Supply, at (617) 292-5770, or fill out the attached information request sheet.

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Cross Connections

A Guide for Massachusetts Business Owners



The Commonwealth of
Massachusetts

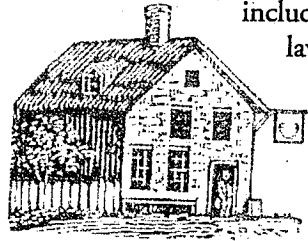
Executive Office of
Environmental Affairs

Department of
Environmental Protection

You as a business owner must protect your drinking water system and the health of your employees, customers and neighbors by preventing or protecting all cross connections on your premises.

What is a cross connection?

A cross connection occurs whenever a potable drinking water line is directly or indirectly connected to a nonpotable piece of equipment or piping. Examples of nonpotable equipment in your facility may include fire protection,



lawn irrigation, air conditioning or cooling systems, as well as high pressure boilers. In a factory, cross connections may

also occur within process equipment such as chemical mixing tanks, plating tanks, and heat exchangers.

Why should I be concerned about cross connections?

An unprotected or inadequately protected cross connection on your premises could contaminate the drinking water not only in your facility, but in neighboring businesses and homes.

Severe illnesses – even death – have been caused by cross connection contamination events that could have been prevented. Unprotected and inadequately protected cross connections have been known to cause outbreaks of hepatitis A, gastroenteritis, Legionnaire's disease, chemical poisoning, body lesions (from exposure through showering), damage to plumbing fixtures, and explosions.

What is my liability?

You are responsible for all unprotected or inadequately protected cross connections on your premises, and liable for any damages or illnesses they may cause. In cases where owners have been proven to be at fault for cross connection contamination events, judges and juries have awarded plaintiffs substantial monetary damages. Additionally, local and state fines of up to \$25,000 per day are possible if you fail to adequately protect a cross connection and place the public health at risk or damage the environment.

What is my responsibility as a facility owner?

You must have your facility surveyed by your local water department to determine if any cross connections exist. You may want to expedite the process and get prepared for the water department's survey by having your facility pre-surveyed by a plumbing contractor. Each cross connection must be eliminated or properly protected by a backflow preventer. All work done on the internal plumbing system of your facility must be performed by a Massachusetts licensed plumber. Any changes to your plumbing must be approved by your local plumbing inspector and public water supplier as necessary.

How can a cross connection incident occur?

Nonpotable water or chemicals used in a system or equipment can end up in the drinking water line as a result of backpressure or backsiphonage. Backpressure occurs when the pressure in the equipment or system (e.g., air conditioning system, boiler, etc.) is greater than the pressure in the drinking water line. Backsiphonage occurs when the pressure in the

drinking water line drops (due to fairly routine occurrences such as water main breaks, fires, heavy demand, etc.) and contaminants are sucked out of the system and into the drinking water line.

But have things like that ever happened?

Yes, they have, and all too often despite the efforts of local water suppliers and DEP. For example, fire protection systems, when not equipped with backflow preventers, can pose an especially significant risk to drinking water and public health, as one recent example illustrates. At an Arizona museum for living plants, backflow from the fire sprinkler system went undetected for two months. During that time, the arboretum received frequent visitor complaints about odd-tasting water and some employees developed gastroenteritis. When management finally decided to investigate, it took a while to pinpoint the culprit. In the meantime, the arboretum had to buy bottled water for its visitors and staff.

Three very small fire suppression systems had been installed at the museum several years prior. Each of them was constructed with black pipe (which is not approved for potable water use), depended on water pressure from the drinking water system to operate, and was filled with propylene glycol and a water/antifreeze solution to prevent freezing. None of the systems was equipped with a backflow preventer (which would have been required in Massachusetts because of the use of antifreeze) but each had a pressure



For more information, fill out the following and mail to: **DEP Division of Water Supply, One Winter Street, Boston, MA 02108.**
Check which information you would like to receive:

- ☐ Cross connection regulations (310 CMR 22.22) ☐ Cross connection guide for restaurant owners
☐ Cross connection guide for consumers ☐ Cross connection information regarding fire sprinkler systems

Name

Company

Address

City/Town

Zip Code