Date Rec'd 11/25/97
Acc't Rec'd 309 - 3
Shelf # 82
Last Inv # 48391

EC 1488 • Reprinted January 1998
$1.50

Backflow Protection
for Private Water Systems

G. Glick Andrews

A change in water pressure can cause water to flow backwards in a water distribution system. This is referred to as *backflow*. For example, if you're running water through an outdoor hose and someone turns water on inside the house, it might cause a loss of pressure.

If backflow occurs while a drinking water supply is in direct contact with contaminated water, drinking water can become contaminated. The illustration below shows some common situations that may lead to backflow contamination.

Contaminated drinking water poses a health risk for your household. Furthermore, backflow down your well threatens the groundwater that supplies you and your neighbors with drinking water.

If you use a private water supply, such as a household well, this publication will help you protect against backflow. You'll learn to evaluate your own water supply system for potential backflow situations and to identify and implement changes.

Public water systems have specific requirements for backflow prevention devices. This publication does not provide information on selecting devices for public water systems.

A variety of backflow prevention techniques and devices is available. They offer varying degrees of protection and are suitable for different situations. Each has limitations.

Air gap

The safest, least expensive method of preventing backflow is to maintain an *air gap* between the water supply outlet and contaminated water (Figure 1). Make sure the gap is at least twice the diameter of the water supply opening. For example, a ¾" hose should have at least a 1½" air gap. The minimum air gap, according to the Oregon Plumbing Code, is 1".

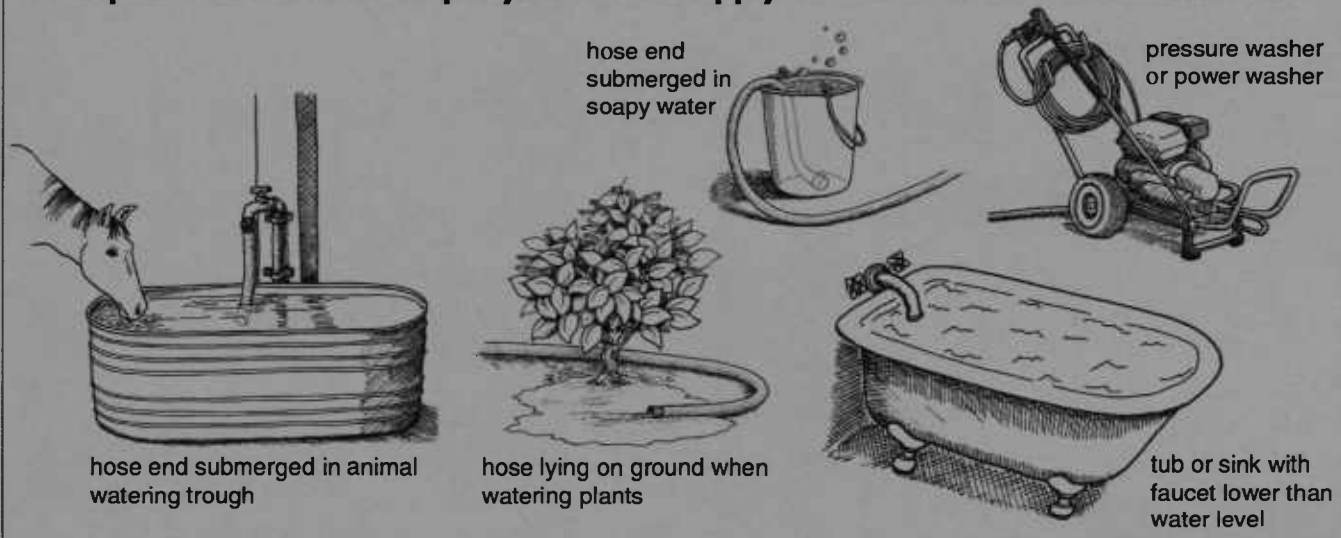
Hose-bibb atmospheric vacuum breakers

Since 1992, the Oregon Plumbing Code has required that all hose-bibbs (faucets threaded for hose connections) have permanent backflow protection in the form of an *atmospheric vacuum breaker* (Figure 2). If a backflow situation occurs, a valve on the breaker closes to let water escape through a small hole instead of flowing back into the water system (Figure 3).

Some faucets come with a built-in backflow device. If yours did not, you can attach a screw-on unit.

The screw-on devices approved by the plumbing code are stamped ASSE-1011. They come with a knock-off locking screw so the device cannot be removed. Freeze-protected brass (not plastic) models are preferable, and are available for less than $10 at most hardware stores.

Examples of situations that put your water supply at risk of backflow contamination



OREGON STATE UNIVERSITY EXTENSION SERVICE

Gail Glick Andrews, Extension water quality educator, Oregon State University.

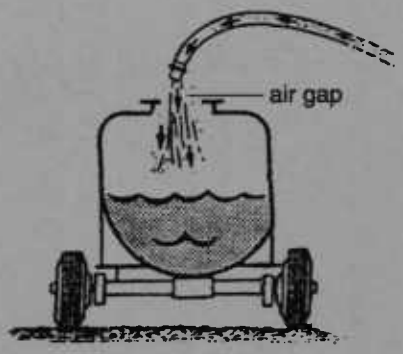


Figure 1.—To maintain an adequate air gap, the hose end should remain above the flood level rim of a vessel.

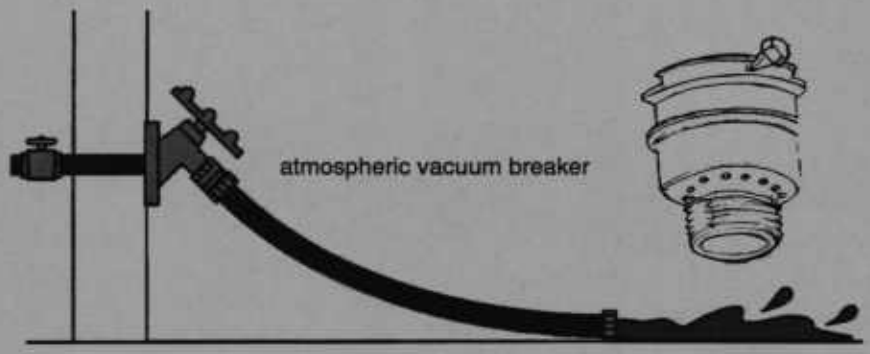


Figure 2.—Hose-bibb atmospheric vacuum breakers are an inexpensive method of backflow protection.

A hose-bibb atmospheric vacuum breaker is the lowest level of protection available. It provides some protection, but should not be your only barrier if extremely hazardous substances may come into contact with your water supply.

Limitations

These units are *not* designed to be operated under back pressure, such as that caused by elevated piping, a downstream pump (e.g., a pressure washer), or cut-off valves below the device.

- All water outlets must be *below* the device. Don't elevate sprinklers, drag the hose uphill, or run a drip irrigation system for hanging baskets.
- There cannot be any cutoff valves downstream of the device, such as spray nozzles, pressurized hose attachments, or drip irrigation systems with valves. Such valves keep pressure in the line.

With back pressure, the valve in the backflow device may become stuck open, and you no longer will be protected against backflow.

Constant back pressure contributes to accelerated device failure. If you must use devices that create pressure downstream, such as a spray nozzle for washing the car, do not leave the line under pressure any longer than necessary. When you are not using the water, open downstream valves to release the line pressure, then turn off the water at the faucet. (If you do not open downstream valves first, you may get sprayed by the backflow device.)

Dirt can get stuck in the valve of atmospheric vacuum breakers, preventing a perfect seal. Also, the rubber spring valve can fail to shut properly.

Inspection and maintenance

If the device is permanently attached, it is very difficult to inspect. If you are *not* installing the unit to meet building inspection requirements, consider installing the device so it is removable. (Don't break the knock-off screw.) You then can take it off periodically and check for debris that may prevent proper functioning. If the rubber parts look aged, install a new device.

***Note*:** If you have a removable device, make sure everyone using your water system knows it *never* should be removed. If this is not possible, install it with the knock-off screw so it can't be removed.

Some models make an audible "pop" when the faucet is shut off (which releases the line pressure, as would happen in a backflow event). This sound is the rubber spring valve snapping shut. As long as you hear this sound, you know the spring is working.

Dual check valves

Dual check valves provide more protection than do atmospheric vacuum breakers. These valves contain two spring-loaded check valves (Figure 4). Screw-on plastic models are available for about $25. They can be a permanent component of the plumbing system, or can be installed as a removable device as needed.

Dual check valves are designed for use in back pressure situations, so may provide the type of protection you want for many gardening and other outdoor water uses.

Because these devices are not considered adequate for public water supply protection, they may be less readily available. Check with plumbing or irrigation suppliers if you are interested in this option. Look for a device stamped ASSE-1024 or IAPMO.

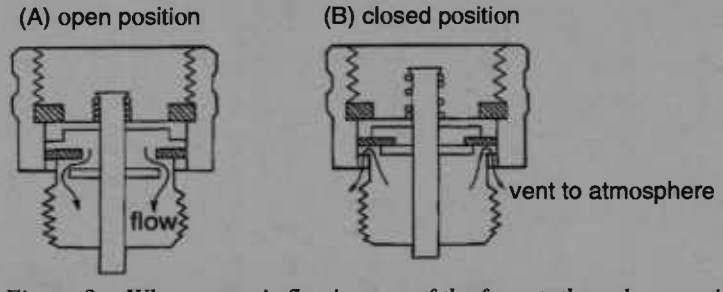


Figure 3.—When water is flowing out of the faucet, the valve remains open (A). In the case of a backflow situation, the vacuum breaker valve closes so that water flowing back toward the faucet escapes through small holes in the device rather than flowing back into the water system (B).

Backflow Risk and Solution Checklist

Step 1.—Identify situations where contaminated water can come into contact with your drinking water.
Check your home and property to see if any of the situations in the checklist occur.

Step 2.—Provide backflow protection.
If you answer "yes" to any of the questions, complete the suggested strategies.

Situation	*Yes*	*No*	*What to do if you answer "yes"*	*Done*
Are plumbing fixtures designed so the water level in the basin or tub can be above the level of the supply outlet? Older sink faucets and shower nozzles on hoses can fit this category.	❑	❑	Replace sink fixtures with new models.	❑
Are garden hose ends submerged in contaminated water such as animal watering troughs, pesticide spray tanks, swimming pools, or puddles from watering plants?	❑	❑	Eliminate these practices. **Never** submerge hose ends in buckets, tanks, or the like. Always monitor the filling process.	❑
Can the water openings of your sprinkler or drip irrigation system contact soil or contaminated water?	❑	❑	Install backflow devices.	❑
Do you use chemical-containing devices attached to your water system, such as pesticide sprayers, radiator flush kits, or power washers with soap capsules?	❑	❑	Determine whether these practices are necessary. If possible, switch to other methods. If you must use these methods, install backflow protection. (Some models have built-in backflow protection, but it is difficult to be sure. Also, not all built-in protection is adequate.)	❑
Do you add chemicals such as fertilizers to your water lines prior to irrigation (chemigation)? See page 4 for more information.	❑	❑	Install a higher level of backflow protection. Understand and follow all regulations from the Water Resources Department.	❑
Are multiple water sources, such as a well and an irrigation ditch, connected to the same plumbing system?	❑	❑	Modify system. If multiple water supplies are connected to your system, separate them.	❑
Are there other situations where potable water (drinking water) comes into direct contact with water that may not be safe to drink?	❑	❑	Install adequate backflow protection.	❑

Limitations

These devices do not provide adequate protection for chemigation or for regular use with toxic substances. Rarely, springs may jam or seals may become clogged by dirt. Eventually, rubber components deteriorate. If the device is not a permanent part of the plumbing, there is a risk it won't be in place when needed.

Inspection and maintenance

When installed, dual check valves are not designed to be tested for proper functioning. You can easily disassemble them, however, for a cursory inspection and periodic cleaning.

Backflow preventers for greater protection

Some backflow protection units may be plumbed in your water system. Pressure vacuum breakers, double check valve assemblies, and reduced pressure backflow preventers are the most common types. Homes built to state plumbing code include appropriate backflow protection for hard-plumbed features, such as underground sprinkler systems. If your house is not built to current code, or you attach devices to your water system that could put your drinking water at higher risk from a backflow event, you may wish to install one of these units.

These backflow protectors cost about $100–200 and are designed to be tested professionally once a year. Check with your local plumbing inspector for the plumbing code guidelines. Most plumbing suppliers and landscape contractors handle backflow prevention products, installation, and testing. Water utilities also may have some information on these products.

Other check valves

If your pumping system has a pressure tank, a series of check valves in the system offers some protection for your well water. However, there have been cases of backflow contamination into wells with these check valves in place. If there are no check valves between your water distribution system and your water source, your aquifer is at a much greater risk from backflow. This situation usually is found in a system with an above-ground pump with no pressure tank.

Backflow protection for chemigation

If you inject agricultural chemicals into your irrigation water, refer to *Chemigation in the Pacific Northwest*, PNW 360. Chemigation is regulated by the Oregon Water Resources Department. Contact the department at the phone number below regarding specific protection to meet your needs.

Gardeners should seriously weigh the backflow risks (and cost of protection) against possible benefits before introducing chemicals to the water system. If you use hose-end sprayers, or fertilizer pellets with drip irrigation, consider alternative methods such as tank sprayers or nonchemical strategies.

Don't forget...

- Whenever possible, maintain an adequate air gap between your drinking water system and contamination sources.
- Provide additional protection based on potential risks and the degree of safety you desire.
- Operate and maintain backflow devices as recommended by the manufacturer.

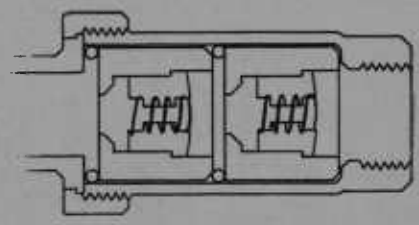


Figure 4.—Dual check valves operate by way of two spring-loaded check valves.

For more information

OSU Extension publications

Chemigation in the Pacific Northwest, PNW 360, by W. Trimmer, T. Ley, G. Clough, and D. Larsen (1992) $1.50

*Home*A*Syst Homestead Assessment System* (a set of 10 publications dealing with protecting the groundwater that supplies drinking water), EM 8546 (1993) $12.00

To order copies of the above publications, send the complete title and series number, along with a check or money order for the amount listed, to:

Publication Orders
Extension & Station Communications
Oregon State University
422 Kerr Administration
Corvallis, OR 97331-2119
Fax: 541-737-0817

We offer discounts on orders of 100 or more copies of a single title. Please call 541-737-2513 for price quotes.

World Wide Web

You can access our Educational Materials catalog and many of our publications through our Web page at eesc.orst.edu

The following publication is available only from the Web and from county offices of the OSU Extension Service:

Twelve Simple Things You Can Do to Protect Your Well Water, EM 8651, by G. Glick (1996). No charge.

Other sources

Terry Swisher, Chief Plumbing Inspector
Oregon Building Codes Division
503-373-7488

Doug Woodcock, Hydrologist
Oregon Water Resources Department
800-624-3199, ext. 208

© 1997 Oregon State University

Produced and distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914. Extension work is a cooperative program of Oregon State University, the U.S. Department of Agriculture, and Oregon counties. Oregon State University Extension Service offers educational programs, activities, and materials—*without regard to race, color, religion, sex, sexual orientation, national origin, age, marital status, disability, and disabled veteran or Vietnam-era veteran status*—as required by Title VI of the Civil Rights Act of 1964, Title IX of the Education Amendments of 1972, and Section 504 of the Rehabilitation Act of 1973. Oregon State University Extension Service is an Equal Opportunity Employer.

Published July 1997. Reprinted January 1998.