
ENVIRONMENTAL Fact Sheet



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Disinfecting a Drinking Water Well

This fact sheet provides instruction for the disinfection of a drinking water well. Disinfection may be warranted due to the presence of total coliform or E. Coli bacteria in the well, recent work performed on the well or water system, or to treat odors or issues caused by certain non-coliform bacteria. If *E. coli* bacteria has been detected, DO NOT DRINK unless the water has been boiled for at least 1 minute or use alternate water.

Understand that disinfecting a drinking water well through shock-chlorination is a process with effects that last at least a few days. You cannot use the water for at least 12 to 24 hours after chlorine is introduced. After the initial 24 hours you will not want to shower in the water for at least a day and will not want to drink it for at least a few days. You should not re-test the well water for bacteria until all of the chlorine is out of the system; sometimes this can take more than a week. It is not uncommon for the disinfection process to cause a change in taste, color and/or water quality. If experienced, these changes typically last less than a few weeks. A well and water system should not need to be chlorinated more than once per year; although dug wells that have never been cleaned sometimes require sequential rounds of disinfection. Aside from when new pumps are installed, many wells never require disinfection. Seek professional guidance for wells requiring disinfection more than once per year, because a repairable structural problem may be the cause.

Many homeowners or small public water suppliers can complete this process without any complications. However, there are many things to be considered and steps that must be followed in order to be safe and successful. If hesitant, contact a licensed well or pump company to have this professionally done.

PRIOR TO DISINFECTION

1. **Water System Inspection.** Carefully inspect the well and other water system components to identify and correct potential pathways that may have allowed bacteria to enter the water system. Inspection items shall include, but are not limited to: 1. properly sealed electrical conduit; 2. a proper well cap; 3. adequate height of the well above ground (minimum 8 inches); 4. signs of rodent or insect intrusion; 5. casing integrity; 6. leaks in the piping; 7. defective pressure tank; and 8. water treatment system (e.g. brine tank, recently changed filters, etc.).

⚠ **CAUTION:** To prevent electrical shock, if a submersible pump is utilized in the well system, turn off the power to the well pump before the well cap is taken off and when it is reinstalled.

2. **Flush the System.** Chlorine cannot reach bacteria entrapped within mud, rust or other solids. If sediment is an issue, flush water through all components of the system including the well, tanks and distribution piping before disinfection. If flushing a hot water tank, to avoid damage to the heating element, the power should be shut off during draining and not turned back on until refilled.

For large diameter dug wells, scrub the walls with a long handle brush or power washer, wash and rinse down, and flush water to waste until well water is clear and sediment removed. **Note: dug wells may be considered**

confined spaces; therefore, proper safety measures should be taken. For smaller diameter wells (drilled wells and gravel wells), pump to waste until water is clear. Flush through an outside faucet to avoid overloading your septic system.

NEVER discharge groundwater directly to a surface water body (ex. wetland, brook or pond). Choose a dry area or a drainage swale where water can percolate naturally through the soil.

3. **Treatment Systems.** Verify with the manufacturer's instructions **BEFORE** disinfecting a treatment system of any type. Some resins, gaskets and filter membranes may be damaged by chlorine. Most times, a slight amount of chlorinated water can go into a treatment system to disinfect it, the system can be put in bypass, then put back in service after the chlorine has been flushed out of the well.

When disinfecting a **PUBLIC WATER SYSTEM**, the following additional steps must be considered:

1. **Take Additional Bacteria Samples.** Rule out possible sampling errors such as non-sterile sample bottles, excessive holding time, and improper collection procedures. To aid in isolating and identifying the source of contamination, sample the following: raw well source(s), first tap after treatment, water in storage, and at the entry point to the distribution system.
2. **Verify Sanitary Protective Area.** Public Water Supply Wells should be located at least 100 feet (often more) away from potential contamination sources (septic systems, storage of bulk materials, roadways, etc). The top of the well casing for public water supply wells must be at least 12 inches above ground and should have a tight-fitting, vented cap with a flexible gasket and completely intact and sealed electrical conduit. Remove potential contamination sources and/or correct the configuration of the top of the well prior to disinfecting. Reroute any surface water pathways leading to the well, or areas where surface water pools near the well.
3. **Notify Water System Users.** Per Env-Dw 503.12, public water systems are required to advise all users at least 2 days in advance of work (including disinfection) performed on the water system.

Any non-transient public water system shall consult their Certified Water System Operator prior to performing work on the water system.

DISINFECTION PROCEDURE

Chlorine is the standard chemical used to disinfect components of a water system. Chlorine comes in liquid form (common household bleach, typically 8.25% chlorine) and solid form as either calcium or sodium hypochlorite (typically as pellets of 70% hypochlorite or 0.79 grams per pellet in weight). It is recommended to use NSF-60 certified products. Do not use bleach or pellets that contain fragrances, algacides, stabilizers, or conditioners. **DO NOT** use pool bleach. The solid calcium hypochlorite pellets are available through a water well industry retail supplier, a licensed water well contractor, or few local hardware stores. Break up any blocks of solid calcium hypochlorite into pellet sized pieces approximately 1/8- 1/4" in size prior to dropping in the well.

⚠ CAUTION: Chlorine is a hazardous material. Read all warnings before use. Wear suitable clothing, gloves and eye protection. Do not leave high concentrations of chlorine in plumbing longer than 24 hours.

Determine the amount of chlorine to use.

The EPA recommended initial dosage for shock disinfection is **10 to 15 mg/L in the water system for 12 hours**, though up to 50 mg/L can be applied if contamination persists. Administrative Rules We 602.03 and We 702.02 require a minimum of 50 mg/L for 4 hours upon completion of well construction and completion of pump installation or pump replacement. Note that higher doses may not be harmful but do require excessive flushing to remove residual chlorine. **Proper chlorine concentration and contact time within the well and water system is of utmost importance. A low concentration that is in the system a short time or water lines left unchlorinated can cause the disinfection procedure to be unsuccessful.**

Calculate the volume of water to be treated to determine how much chlorine is needed (liquid, solid or both) to reach a desired concentration (the following tables provide a helpful guide). It is important to understand whether you need 3 cups of bleach or 3 gallons. Using a little more or a little less is not detrimental. Most private wells are adequately disinfected by using less than ½ gallon of bleach or a couple handfuls of pellets. High yielding wells often require more disinfectant. Public water systems with atmospheric tanks and hundreds of feet of distribution piping will need multiple gallons of bleach.

Use the following tables to estimate the volume of water in the well. If the depth of the well is unknown yet believed to be greater than 200 feet, presume it to be 400 feet (near average depth for bedrock wells).

Approximate Water Volume in Wells
(rounded to the nearest gallon)

Water Depth in Well (feet)	Diameter of Well (inches)			
	Bedrock or Gravel Wells		Dug Wells	
	6-inch	8	36-inch	48-inch
20	30	51	1,060	1,880
200	293	512	--	--
400	588	1,044		
600	881	1,566	--	--

In addition to the volume of water in the well, calculate the volume of water to be treated within tanks and pipes. For private wells this volume is relatively small compared to the well volume in the well; to be conservative, add 50 gallons to your well volume calculation.

For Public Water Systems with atmospheric and/or larger hydropneumatic (pressure) tanks, additional liquid bleach is required to properly disinfect the large volume of water in the tanks. When possible, this liquid bleach shall be put directly into atmospheric storage. DO NOT attempt to add liquid bleach directly into a pressure tank.

To reach a concentration of 10 ppm in a 10,000-gallon tank, add 1.25 gallons of liquid bleach. Simply multiply the volume of bleach if you want a higher concentration of chlorine (a 10,000-gallon tank needs just over 5 gallons to reach 50 ppm) or have a higher volume tank (e.g. a 20,000-gallon tank needs 2.5 gallons to reach a 10 ppm concentration). Also, incorporate the calculation of water in distribution to the liquid bleach added directly to tank. For reference: there are approximately 4 gallons of water in 100 feet of a 1-inch diameter pipe and approximately 16 gallons of water in 100 feet of a 2-inch diameter pipe.

Shown below are amounts of chlorine required, as either bleach or pellets, for chlorine concentrations and various volumes of water. Solid chlorine takes longer to dissolve; therefore, it is used to treat water at deeper depths. If disinfecting wells less than 200 feet deep, liquid bleach or pre-dissolved pellets are all that is needed.

Approximate Chlorine Volume for Well Disinfection

Target Chlorine Concentration (mg/L or ppm)	Water Volume (Gallons)	Volume of 8.25% Chlorine Stock (Common Bleach)	Equivalent Weight of 70% Calcium Hypochlorite Pellets (0.79 g/pellet)
10	100	1/4 cup	6 pellets
	500	1 cup	31 pellets
	1,000	2 cups	63 pellets
50	100	1 cup	31 pellets
	500	4 cups	157 pellets
	1,000	½ gallon	315 pellets

Note: There are 4 quarts in a gallon, 4 cups in a quart and, 16 cups in a gallon.
To reach a concentration of 5 ppm, use half the chlorine listed to reach 10 ppm
Quantities given in this table are approximate and are rounded to the nearest practical measurement.

Add the disinfectant to the water system.

The typical procedure of disinfecting a well and water system is as follows:

1. Shut off power to the well pump. Shut off water to irrigation systems (at a valve); leave off until after step 10.
2. Take the well cap off the well, inspect and clear away any debris. Correct any issues.
3. Add chlorine to the well in the amount determined with the tables and instructions above.
4. Connect a garden hose to either the spigot at the base of the pressure tank or an outside spigot that does not go through water treatment, and run the hose to the well.
5. Turn on power to the pump and open the spigot to the hose at the well. Recirculate water through the hose back down the well until chlorine is smelled in the water. If a heavy smell of chlorine (greater than that of pool water) is not present after 30 minutes, add more disinfectant. Test the chlorine concentration with test strips, if they are available.

NOTE: Be sure to wash chlorine particles off wires and other parts of the well interior (pitiless adaptor, the small circular fitting 4-5 feet down) as chlorine is very corrosive and will damage wiring and fittings.

6. Once a heavy chlorine odor is present from the hose, run every faucet in the house – one at a time – to draw the disinfectant through distribution (outside faucets, sinks, showers, tubs, dishwasher, washing machine, etc.). Once you can smell chlorine at a faucet, turn it off. *See previous notes on disinfecting treatment systems.*

Bacteria in a water line that is not adequately subjected to chlorine (at appropriate concentrations and contact time) can survive the disinfection process and easily spread through the water system.

7. Once chlorine is introduced into the entire water system, turn off the spigot to the hose, shut off power to pump, and secure the well cover. In some cases, more often with public water systems, the well volume may be insufficient to adequately dose pipes and tank(s). As such, re-dosing the well after sending chlorinated water to the storage tank and/or distribution may be needed, particularly if the well is shallow.
8. Let the water sit in the well and piping overnight to allow adequate contact time of the chlorinated water.
9. After adequate contact time, flush the well by running an outside faucet to a dry area **away** from plants, streams or ponds, and leach fields. Note that the water will be highly chlorinated, may be discolored, and/or have an increased amount of sediment in it.

In the event of a low-producing well, it is advised to leave the hose on for less than an hour at a time. Let the well rest for at least an hour in between flushing attempts.

10. Continue flushing until the chlorine smell is gone - this may require repeated flushing over several days.

The disinfection process is complete. If you choose, re-sample the water for bacteria. Prior to re-sampling, it is advised that the water be tested with chlorine strips to verify there is no residual chlorine. If bacteria persist even though the source of contamination has been addressed, repeat steps 1-10. If bacteria persist and the source has not been identified, re-inspect the system and/or seek professional help prior to repeating disinfection.

Permanent Disinfection. If *E. coli* bacteria persists after all sources of contamination have been corrected, it may be best to install a new well. If only Total Coliform bacteria persist in the well after all sources of contamination have been corrected, a UV disinfection may be a solution. Please see our fact sheet on “Ultraviolet Water Disinfection” for additional guidance.

FOR MORE INFORMATION

Contact NHDES Drinking Water and Groundwater Bureau or the New Hampshire Water Well Board at (603) 271-2513 or dwgbinfo@des.nh.gov or visit www.des.nh.gov.

Note: This fact sheet is accurate as of June 2019. Statutory or regulatory changes or the availability of additional information after this date may render this information inaccurate or incomplete.