

# Procedure for Shock Chlorination of Water Systems Using Bedrock Wells

Maine CDC Drinking Water Program • 11 SHS Augusta, ME 04330 • 287-2070 • www.medwp.com



Shock chlorination is a disinfection treatment recommended when a drinking water system has been contaminated with total coliform or E. coli bacteria. The presence of bacteria in a well is usually caused by the intrusion of surface water contaminated by decayed material, animal/human waste, or other substances. This intrusion can sometimes be attributed to a defective or damaged well casing or casing seal, an improperly installed pitless adapter, a casing that terminates too close to ground level, or a shallow bedrock fracture. If any of these situations exist, then no amount of shock chlorination will permanently solve the problem, and a licensed water professional should be consulted.

Frequently, bacteria can be introduced during the well drilling process, installation of the pump system, subsequent servicing of the well pump, pipe repairs, storage tank replacement, or an inadequate well cap installation that allows vermin and insects access to the well casing. Any cause or causes for contamination should be fully investigated prior to shock chlorination, since contamination will likely reoccur if the cause is not addressed.

## HOW TO EFFECTIVELY SHOCK YOUR WELL

Shock chlorination of a well is an involved process that cannot be rushed. It requires time, planning, preparation, proper methods, and proper materials. Carefully read these directions before starting the shock chlorination process. Be sure you understand them completely, or consider hiring a well contractor or other licensed water professional for assistance. **It will be necessary to provide an alternate source of drinking water until the well shocking process is completed; use of the water system must be minimized since very high levels of chlorine will be present. Highly chlorinated water should not be used for drinking, bathing, or cooking.** Remember, the objective is to disinfect the entire water system (not just the well). Prior to disinfection, ensure that the entire well and piping system has been running with sufficient flow to purge any sediment, foreign matter, or corrosive material (due to unsanitary construction, repair, or an extended period of idleness). These substances can react with the chlorine solution and decrease its effectiveness in destroying bacteria. **NOTE:** When shocking a water system that has treatment, bypass the treatment equipment so that the heavily chlorinated water does not come in contact with the treatment media, and refer to manufacturer's recommendations on how to disinfect the treatment equipment and media.

**1. PREPARATION:** Determine the correct amount of liquid bleach (6% sodium hypochlorite) needed by using the following dosages, which are based on the depth of a typical six-inch diameter bedrock well:

### Disinfection Dosage per Depth in Feet

DEPTH	50ft	100ft	150ft	200ft	250ft	300ft
DOSAGE	1 Qt	1 1/2 Qts	2 Qts	2 1/2 Qts	3 Qts	3 1/2 Qts

**Note:** If using Clorox "Concentrated" Bleach (8.5% sodium hypochlorite), use  $\frac{2}{3}$  of the amounts shown above.

Do not use bleach in excess of the recommended amount, since this will only require additional flushing before the system is ready for use. Use proper personal protective equipment, including gloves and eye protection. Prepare the chlorine solution by mixing the specified amount of bleach to about 10 gallons of water - typically in two, five-gallon pails. Follow the manufacturer's recommendations for handling and mixing disinfectant. Switch off power to the well pump, and drain as much water from the system as possible. If the system has a hydropneumatic pressure tank, check with the manufacturer to determine if the chlorine solution will harm the tank's membrane material. For air-over-water pressure tanks, release the air to allow the tank to be completely filled with chlorinated water. After switching off electrical power (or gas or oil burners), drain all water heaters to allow the solution to circulate through the hot water system as well.



## Keep Your Drinking Water Safe:

✓ Protect Your Source

✓ Take Your Samples

✓ Maintain Your Treatment

✓ Inspect Your Pipes & Tanks

**2. APPLICATION:** Remove the well cap, carefully pour the chlorine solution into the well. Allow solution to “settle” into the well (and its bedrock fractures) undisturbed for three hours. Attach a hose to a nearby sill cock, restore power to the well pump, and circulate chlorinated water through the hose only. Thoroughly wet the inside of the well casing, supply pipe, pitless adapter, your gloved hands, and the well cap. After washing down the well casing for a minimum of 30 minutes, carefully reinstall the well cap. Obtain spare replacement gaskets or other parts as necessary to properly re-cap the well before proceeding. If there are other outside faucets, go to the furthest from the well, open the faucet and run the water until chlorine odor is detected. Repeat this procedure for all other outside faucets. The procedure is the same for inside plumbing fixtures, including cold and hot water valves (hot water heater turned off), showerheads, laundry fixtures, dishwashers, and toilets. Allow the chlorinated water to stand in the well and the entire water system for a minimum of 12 hours (24 hours is recommended). During this time the system should be considered unusable - with the exception of moderate toilet use. After 12-24 hours, chlorinated water can be flushed from the system through the furthest outside faucet until the chlorine odor is no longer present. Once the chlorine odor is no longer detectable at all outside faucets, repeat the process for all indoor faucets and fixtures. Take care not to discharge large amounts of heavily chlorinated water into a septic system, nearby lakes, rivers, ponds, or any surface waters, onto lawns, gardens, or sensitive plants. When no chlorine odor can be detected at any inside faucet or fixture, restore power to water heaters.

**3. FOLLOW-UP ACTIONS:** After waiting at least one week for the chlorine to dissipate, collect a water sample for total coliform and *E-Coli* (bacteria) analysis by a state-certified laboratory, following proper sampling procedures. The laboratory will likely reject a sample containing even a trace of chlorine, so the use of a chlorine residual test kit is recommended to ensure that chlorine is not present before taking the sample. If bacterial contamination is detected in this sample, repeat the entire shock chlorination process, followed by a second bacteria test. A third positive bacteria test is a likely indication that a structural problem exists within the well or the source aquifer is contaminated. Upon a third positive bacteria sample, contact a well professional to thoroughly evaluate the condition of the well. If no problems are found that can be corrected, the installation of a continuous disinfection (chlorination) system will be necessary to ensure a safe supply of drinking water. If problems are found and corrected, shock chlorinate the system per this procedure, before taking a bacteria sample to ensure that the repairs have been effective.

**4. ADDITIONAL IMPORTANT CONSIDERATIONS:** The chlorine solution must come into direct contact with the bacteria that it is intended to eradicate. If there is a significant amount of scale or slime (“biofilm”) on the surfaces of the casing or bedrock, it will effectively shield the bacteria and prevent the chlorine solution from coming in direct contact with it. In this situation, mechanical cleaning and purging of the well may be required prior to any attempt at shock chlorination (contact a well professional).

#### **REMEMBER:**

**Bypass Treatment:** When shocking a water system that has treatment, bypass the treatment equipment so that the heavily chlorinated water does not come in contact with the treatment media (which could potentially cause damage to the media), and refer to manufacturer’s recommendations on how to disinfect the treatment equipment and media.

**Keep pH in Mind:** Another important factor, frequently overlooked, is the effect of well water pH on the disinfection process. Chlorine’s effectiveness as a disinfectant decreases dramatically in high pH water. Chlorine is 100% effective as a biocide when used in water having a pH of 5.5, but only 34% effective at a pH of 7.6, and only about 10% effective at a pH of 8.1. Chlorine itself has a high pH: when a 50 ppm solution is added to water with a pH of 7.2, the pH of the mixture rises to 7.6, further reducing the chlorine’s biocidal effectiveness. Typically, the deeper the well the higher the pH. To effectively shock chlorinate a well with high pH water, consult a licensed water professional for assistance.

**FOR FURTHER INFORMATION, CONTACT THE DRINKING WATER PROGRAM AT 287-2070.**