

SHOCK CHLORINATION PROCEDURE FOR CONTAMINATED WELLS

This shock chlorination procedure is designed for disinfecting groundwater wells that have been tested positive for E. coli or fecal coliform. For disinfecting wells to control iron or sulfur bacteria, please contact your Environmental Health Officer or Public Health Inspector.

BEFORE YOU START

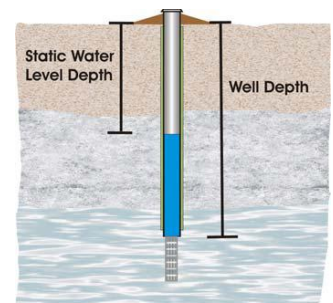
1. Store sufficient water to meet family needs for 24 hours, including the water required for animals. Note that the water is not safe for drinking and must be boiled for one minute or treated before being used. Consult with your Environmental Health Officer or Public Health Inspector on proper ways of disinfecting your water supply.
2. Before attempting to chlorinate the well, it is essential to check the following:
 - All repairs to the well should be completed before the chlorination process
 - Check the condition of the well: location, well casing, and sanitary seal (well cap)
 - Check the condition of the plumbing system: leaking pipes, pressure tank and cross connections
3. Shock chlorination is a process designed to inactivate harmful bacteria within the well and distribution system. If the bacteria have been introduced to the well directly or by means of poor siting or well design, shock chlorination should effectively reduce the bacteria levels. Shock chlorination is NOT intended to provide disinfection of the aquifer beyond the immediate location of a well.
4. Unless you are familiar with water wells, and are comfortable working with chemicals, the process should be done by a licensed water well contractor or licensed plumber. If you have point-of-use or point-of-entry home water treatment devices, consult with your water treatment company before starting with chlorination.
5. Chlorine is a strong oxidizing agent and is highly corrosive. It may cause skin and eye damage, or irritation to the nose and/or throat. Use goggles and rubber gloves when handling this material. It is also recommended that protective clothing (splash apron) and rubber boots be worn. Always provide adequate ventilation when using chlorine.
6. Materials Required
 - A clean water tank with a holding capacity of at least 1,360 litres (300 gallons)
 - Garden hose
 - Appropriate volume of chlorine or bleach solution

PROCEDURE FOR SHOCK CHLORINATION

1. Measure the well depth and the static or resting water level, then calculate the depth of the water in the well using the following formula:

$$\text{Depth of water} = \text{Total well depth} - \text{Static water level depth}$$

To measure how much water is in the casing, carefully drop a weighted fishing line into the well until you hear it hit the water (static water level). Mark the fishing line, and measure the distance to the water level. Subtract this amount from the total casing length (well depth). Well depth and static water level can also be determined from the water well drilling report.



2. Using Table 1, determine the amount of water and chlorine solution required. Pump the recommended amount of water into a clean water storage container. A clean galvanized stock tank or pick-up truck box lined with a 4 ml thick plastic sheet is suitable.
3. Mix the recommended amount of chlorine with the water to give the recommended 50 ppm chlorine solution.

| Casing Diameter | Volume of Water Needed per 1 ft (30 cm) of water in casing | Millilitres of 5.25% Bleach needed per 1 ft (30 cm) of water | Millilitres of 12% Industrial Bleach needed per 1 ft (30 cm) of water |
|------------------------|---|---|--|
| Inches / mm | Gallons / litres | millitres | millitres |
| 4 100 | 1.1 / 5 | 4.75 | 2.1 |
| 6 150 | 2.4 / 10.9 | 10.5 | 4.55 |
| 8 200 | 4.2 / 19.1 | 18.0 | 8.0 |

4. Household bleach is easy to obtain, inexpensive and already in liquid form for easy mixing. **Use fresh bleach that does not contain detergent or other additives.** Industrial bleach, usually in the form of calcium hypochlorite, is used to disinfect swimming pools and can be found in hardware stores and pool equipment outlets. This material should be handled with care since the dust will irritate the eyes, nose, mouth and skin. Calcium hypochlorite is also highly corrosive when wet.
5. Loosen and remove the well cap, be careful not to contaminate the cap. Caution should be taken when removing the well cap, as bare wires may be exposed posing an electrical hazard.
6. Attach a clean hose to the water storage container and place the other end of the hose into the well casing. Introduce the chlorine solution into the well and wash down the interior of the well casing in a swirling motion from top to bottom. If there is no spigot on the water storage container, siphon the solution into the well.
7. To disinfect the distribution system open one hot faucet first and let the water run, then open the cold water faucet farthest from the pressure tank and let the water run until a strong chlorine odour is detected. Open the remaining cold faucets one at a time (including dishwashers, washing machines etc) in the distribution system until the water coming out has a chlorine-like odour.

Caution: Do not let all of the water faucets run at the same time because you may loose system prime or damage your pump.

Shut the faucets off once a chlorine odour is detected or after testing for chlorine if you are using a chlorine test kit.

8. It is best to verify the chlorine concentrations by using a test kit. Chlorine test papers are available through restaurant or swimming pool suppliers. There should be at least 10 ppm of chlorine in all faucets. If chlorine is not present or is weak at any faucet, it is an

indication it is being used up in cleaning the well and you may need to add small amounts of chlorine into the well to maintain or increase the desired chlorine concentration.

9. Make sure the chlorine reached the whole system by completing the following:
 - Starting at any location, open the remaining hot water faucets one at a time until each faucet has been run. Allow hot water to run at least 30 to 60 seconds until a strong chlorine odour and/or a noticeable drop in water temperature is detected. In some cases, the water heater may have to be completely emptied before chlorine concentration can be detected at the faucet. Shut the faucet off after proper concentration is noted.
 - All the toilets should be flushed at least once. Check chlorine concentration inside the water tank above the toilet.
 - Unfinished plumbing that has been capped (plumbing dead ends) should be flushed. If necessary, provide a temporary faucet. Plumbing that is no longer in use should be removed from the distribution system. Contact a licensed plumber to perform the work. Check chlorine concentration and shut each faucet off after proper concentration is noted.
 - All outside spigots and household appliances connected to the water supply (i.e. dishwasher, washing machine, ice maker, etc.) must be disinfected. Check chlorine concentration and shut faucets off after the proper concentration is noted.
 - If fire suppression is present, partly drain the system storage tank so the pump turns on and begins drawing chlorinated water into the system and the tank. Then shut the pump off and check chlorine concentration at the storage tank outlet drain.
 - Disconnect the water feed line to the furnace humidifier and turn the valve on and allow the water to run until a proper chlorine concentration is noted.
10. After completing the chlorination, rinse the well cap with chlorinated water and turn the outside spigot off. Replace the well cap to form a watertight seal. All bolts and screws must be reattached. If any parts are lost or broken, replace them as necessary.
11. Once the chlorinated water has reached all the appliances, fixtures and faucets, let the chlorinated water stand in the well and plumbing system for 8 hours.

**WHILE THE CHLORINE IS IN THE SYSTEM DO NOT DRINK THE WATER.
CONTACT WITH THE WATER MAY CAUSE SKIN, EYE AND NOSE IRRITATION.**

12. When the chlorine has been contained in the well for 8 hours, start flushing the chlorine from the system by running an outside spigot to a culvert or drainage ditch until you can no longer detect chlorine in the water. NOTE: Do not run the well excessively (i.e. slowly flush low yielding wells) to avoid damaging the well pump. Avoid running the water into or onto the septic system. Flush the chlorinated water into an area where desirable vegetation will not be harmed, such as a gravel driveway and away from any surface body of water.
13. After the chlorine has been flushed from the well, flush the hot and cold water faucets, appliances and fixtures, one at a time. The length of time for flushing depends on the concentration of chlorine, depth of the well, formation type, the pH and the size of the distribution system. It will usually take 4 to 8 hours to flush the well after a standard well

chlorination. The water may become discoloured during flushing because the chlorine may have loosened the hard water deposits in the plumbing.

**Caution: The chlorine must be completely flushed from plumbing system.
Chlorine may damage the rubber and plastic parts in the faucets and plumbing.**

14. Backwash all filters and softeners and regenerate any water treatment equipment. Consult your water treatment equipment supplier for any specific procedures required for backwashing and regenerating any water treatment equipment.
15. Take another water sample for analysis after seven (7) days.

For more information, please contact your nearest Environmental Public Health office.

Calgary Main Office 403-943-2295
Lethbridge Main Office 403-388-6689
Edmonton Main Office 780-735-1800
Grande Prairie Main Office 780-513-7517
Red Deer Main Office 403-356-6366

Technical Advisory Committee on Safe Drinking Water, Environmental Public Health