



Simple Chlorination

The following is an excerpt from the [Water Well Disinfection Manual](http://www.michigan.gov/documents/deq/deq-wb-dwehs-wcu-disinfectmanual_221334_7.pdf) by the Michigan Department of Environmental Quality. This document can be viewed in its entirety on-line at http://www.michigan.gov/documents/deq/deq-wb-dwehs-wcu-disinfectmanual_221334_7.pdf.

Well chlorination is performed in response to coliform bacteria detection in a sample collected from a drinking water well. Due to the complicated process and potential damage to either a well or the water distribution system, and risk for personal safety, a well owner is strongly encouraged to hire a licensed well driller to perform this disinfection. A well driller should perform steps 1-11. A homeowner can complete steps 12-16 to complete the process.

Simple chlorination is the process of adding a small volume of chlorine solution into the top of the water well, followed by circulating the chlorine into the water supply's distribution system. This simplified procedure is used to disinfect the upper portion of a well casing, the well pump, the drop pipe, the water service line, the pressure tank, and the building distribution system. As the pump is operated, the chlorine is drawn to the pump intake and from there into the distribution system. Simple chlorination can be effective for existing water supplies and should not be used for newly constructed wells unless sampling shows the well is not the source of the bacterial contamination.

With simple disinfection, there is no assurance that the chlorine will get to the bottom of the well or into the aquifer around the well. Water is flowing from the bottom of the well up to the pump intake, minimizing the chance that any portion of the well below the pump intake will be exposed to the chlorine. When used for treating existing water supply systems, it should be used only for the first treatment. If simple chlorination is unsuccessful at disinfecting the existing well, the bulk displacement method of well chlorination should be used.

Disinfection of flowing wells, wells with deep well jet pumps, wells with drawdown seals, or wells in pits should not be attempted by well owners. A registered water well drilling contractor should be contacted to perform well treatment on these types of wells.

Simple Chlorination Procedures

The following simple chlorination procedures are recommended for treating a typical 4 to 6 inch diameter home water well system with a submersible pump.

1. **Remove Turbidity** - If the well water is not clear, pump it to waste until it clears up before starting the chlorine treatment. Turbidity (cloudiness) in the water can reduce the effectiveness of the chlorine.
2. **Bypass Cartridge Filters** - If the water system has a cartridge filter, place its valve in the "bypass" position and remove the cartridge housing and cartridge. Discard the old cartridge. Rinse the housing with a solution of 1 tablespoon of bleach and a cup of water. Drain the housing and insert a new filter cartridge. Reinstall the cartridge housing and filter, but leave the cartridge filter valve in the bypass position until the chlorine has been completely flushed from the water supply after treatment.
3. **Bypass Other Water Treatment Units** - Bypass water treatment units, such as water softeners, reverse osmosis (RO) systems, and iron removal systems. Follow manufacturer's recommendations pertaining to disinfection of treatment units. Then leave the units in by-pass position until all chlorine has been flushed. High concentrations of chlorine can damage softener resin (Keller, 1991) and RO membranes.
4. **Check Water Well Record** - Check the water well record to see if there are drawdown seals or other devices that will prevent chlorine from reaching the water. If there are, or if you are unsure, contact a Michigan registered water well drilling contractor to perform the disinfection.
5. **Turn Off Power to the Pump Before Removing the Well Cap.**
6. **Prepare a Chlorine Solution** - Prepare a chlorine solution using the table below. Any brand of unscented liquid household bleach that contains 5 ¼ to 6 percent available sodium hypochlorite may be used. Swimming pool chlorine and scented products should be avoided.

Chlorine Solution Table		Example:
Well Diameter	Amount of bleach per 25 feet of well depth	
4 inch	1 cup	A 4-inch diameter well 150 feet deep would need 6 cups of bleach to treat the well. Therefore, a total of 8 cups of bleach will be mixed with the 5 gallons of water.
5 inch	1 ½ cups	
6 inch	2 cups	

7. **Mix** - Mix the bleach with 5 gallons of clean water in a clean plastic or glass container and add an additional 2 cups of bleach (to assure sufficient chlorine for disinfection of the pressure tank, water heater, and distribution system).
 8. **Pour** - Slowly pour the mixture into the top of the well.
 9. **Circulate** - After the chlorine has been applied to the well, turn the pump on and circulate the chlorinated water through the service lines and plumbing. Attach a hose to an outside tap and run the water to waste (discharge onto the ground surface) until a chlorine smell can be detected in the water and the water is clear. Do not discharge the water into a sewage treatment system.
 10. **Recirculate - Do not start this process until the water from the hose is clear.** Use the garden hose to recirculate the chlorinated water back into the top of the well. Wash down the inside of the casing for at least 30 minutes. During this process, water circulates from the pump, through the drop pipe, service line, pressure tank, distribution piping, and hose back into the top of the well. This recirculation of the chlorinated water will help assure a uniform distribution of chlorine between the top of the water column in the well and the pump intake (Jones, 1979). The recirculation of chlorinated water enhances the chlorination process by not only exposing surfaces to chlorinated water, but also to the cleaning effect of agitated (flowing) water.
 11. **Reinstall the Well Cap** - After the recirculation period, turn off the water to the hose and cap the well.
 12. **Open Taps** - Open each tap within the home, one at a time, starting closest to the pressure tank, and run water until a strong chlorine smell is present. Close the tap. Do not forget to flush each hot water tap.
 13. **Contact Period** - Allow the chlorine to remain in the water supply for 4 to 12 hours, preferably overnight (Lehr, et al., 1988). Contact time is an important part of the chlorine treatment process. The longer the chlorine is allowed to remain in the water supply system, the better the chance that the chlorine will contact and kill microorganisms that may be present. Water use during the contact time should be minimized to assure that chlorine residual remains in the well.
 14. **Flush** - After the contact period, pump to waste to remove the chlorine from the water supply. Flush until the chlorine smell can no longer be detected. After the chlorine smell can no longer be detected, it is recommended that flushing be continued for an additional 1 to 2 hours, since there may still be traces of chlorine in the well. This will help assure that all traces of chlorine have been removed. Flushing for an extended period of time after treatment with chlorine will also help clean the system because of the scouring action of the water.
- For this period of pumping to waste, use a hose connected to an outside tap, discharging into the yard, a roadside ditch, etc. If possible, avoid pumping chlorinated water on lawns and landscape plants. The outside tap should be allowed to run in the fully open position to maximize the pumping rate.
- Do not run the water into the household plumbing, and subsequently into the septic tank/tile field, during this pumping period. Overload of the sewage treatment system can occur.
 - Do not run the water into a lake, stream, or other body of water.
15. **Reactivate Treatment Systems** - When all traces of chlorine are gone, place the disinfected water treatment units back online.
 16. **Sample** - Collect a bacteriological water sample. Before sampling, a check for residual chlorine should be done using a chlorine (swimming pool) test kit or a chlorine meter. If a test kit or chlorine meter is not available, continue to flush for at least 2 hours after there is no chlorine smell, before collecting the water sample.

Turbidity as a Result of the Chlorination Process

Water from a water supply system that has been treated with chlorine can be turbid due to the effect of the chlorine on minerals in the water (such as iron) and biofilms that may be present. Extended pumping normally clears the water of turbidity.