



Shock Chlorination: Disinfecting the Hot Water Portion of Household Plumbing

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This fact sheet describes how to disinfect the hot water supply in a household using shock chlorination. For background about shock chlorination, see the fact sheet “Shock Chlorination: Background and Principles (FS-06-68).” For information about disinfecting the entire household plumbing and water supply system, including the well, see the fact sheets “Shock Chlorination: Estimating the Amount of Bleach Needed (FS-06-69)” and “Shock Chlorination: A Step-by-Step Guide to Shock Chlorinating Wells and Home Water Supply Systems (FS-06-70).”

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INTRODUCTION

As noted in “Shock Chlorination: Estimating the Amount of Bleach Needed (FS-06-69)” hot water heaters are part of household plumbing that can be treated during general shock chlorination accomplished by adding chlorine bleach. However, it may be necessary to disinfect only the hot water system in a household, because of tastes or odors caused by specific types of bacteria growing in the water heater. Hot water heaters may become contaminated with bacteria that are adapted to hot environments. Although these bacteria are generally harmless to people, their activity may produce smells and tastes that are objectionable.

Note that not all taste, color and odor problems are caused by bacteria. For example, if well water contains minerals, such as manganese or excessive iron, these may color the water and stain fixtures. Dissolved hydrogen sulfide gas in well water is driven out as water is heated, so that when hot water exits a tap or shower head the



characteristic rotten egg smell becomes very noticeable. If colors or odors are caused by substances that are present in the raw well water source, shock chlorination may temporarily help, but these problems will return very quickly.

TREATING THE HOT WATER SYSTEM

Just as with cold water, ordinary unscented liquid bleach, commonly sold in grocery stores, is an effective disinfectant for this type of bacteria. As a first step, drain and flush away accumulated sand, sludge, or loose scale from the tank. Sediments may protect bacteria from chlorine and also reduce energy efficiency and useful life of a hot water heater. If well water contains sediment, it is likely to accumulate in the hot water heater and should be flushed from the water heater at least once a year.

Remove sediment by connecting a garden hose to the drain at the bottom of the tank (see Figure 1). Water discharging from the water heater is hot. Run the hose away from areas where it may scald pets, children, and landscaping. It is also worthwhile to place the discharge end of the hose on something light colored that



will not be damaged by hot water, to observe the material flowing out. If draining water contains sediment the entire time that the tank is being drained, it may be necessary to fill and drain the tank again. It may take more than one effort to remove sediment but savings in energy costs and prolonged tank life will more than make up for the effort. If you are unclear about how to flush the tank, seek advice from a plumber or from the manufacturer of the water heater.

In order for the procedure described below to work properly, you must be able to develop a siphon from a bucket filled with a strong bleach solution through the water heater. This means that the point where water drains from the tank should be well below the bottom of the bucket. If the faucet on the hot water heater is above the bottom of the bucket that will be used to introduce bleach into the hot water tank, you may have to connect a hose to the tank to lower the point from which water drains. For example, if the hot water heater is on the second story of a building, and the point at which bleach is introduced into the system is on the first floor, you will need to extend a hose from the tank drain to

- 1. **Electric**
- 2. **Gas**
- A. **Cold water in**
- B. **Hot water out**
- C. **Shutoff valve**
- D. **Temperature/pressure relief valve**
- E. **Insulation**
- F. **Outer case**
- G. **Anode rod**
- H. **Thermostat**
- I. **Electric heating elements**
- J. **Drain valve**
- K. **Burner control**
- L. **Dip tube**
- M. **Overflow**
- N. **Steel tank**
- O. **Burner**

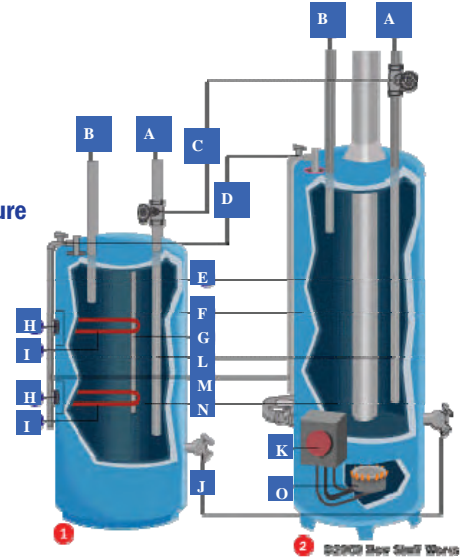


Figure 1: Schematic diagram of a gas and electric water heater (with permission from <http://home.howstuffworks.com/water-heater2.htm>)

the first floor to achieve a good siphon to draw the bleach solution into the hot water tank. If you doubt that you can achieve a suitable siphon, do not proceed with the following steps.

Before beginning disinfection, you will need a garden hose to drain the hot water tank, a three-to-five gallon plastic bucket, a short piece of hose (two-to-six feet long) with a male hose fitting on one end, unscented liquid household bleach, rubber gloves, and goggles. It may also be useful to have an assistant. This job is much easier to do with two people.

While treatment is taking place hot water should not be used. This includes clothes washing machines, showers, dishwashers, and hot water taps throughout the house. The high concentrations of bleach used during disinfection may damage clothing and irritate sensitive skin and eyes.



Hose connected to the hot water faucet in a laundry room sink. The bleach solution is being siphoned into the household hot water system.

DISINFECTING THE HOT WATER SUPPLY, STEP-BY-STEP

1. If the water heater is electric, turn the power off. If the water heater is gas or propane, set the thermostat as low as it will go. This keeps the water temperature cool, which preserves the active ingredients in bleach.
2. All hot water heaters have a pressure relief valve that prevents explosions. In most cases the relief valve is connected to a pipe that leads outside to prevent damage from water discharges in the house. Be sure that the pressure relief piping is unobstructed. The end of the pipe should always be open and dry. If you can see water dripping steadily from the end of the pipe, the relief valve should be replaced.
3. Make sure that all hot water faucets are off. Bleach is introduced into the system by siphoning, which will not be possible if a hot water faucet is left on.
4. Locate the cold water valve leading into the hot water tank and turn it off. Normally this valve is on top of the tank. By closing this valve the hot water tank will be isolated from the rest of the water system in the house.
5. If the garden hose that was used to drain the sediment from the tank has been removed, reattach it and direct the hose to a location, preferably outdoors, where hot water discharges will not cause injury or damage.
6. Attach the short piece of garden hose to a hot water tap nearest to the water heater. In most cases this faucet will be located in a laundry room. If there is a hot water tap available that has male hose thread (such as the hot water tap for the washing machine), attach the hose there. If such a connection is not available use a piece of hose that can be slipped over the end of a faucet and attached with a hose clamp to make the connection air

tight. Make sure that the hose is sturdy, because it will be used to siphon the bleach solution and flimsy hoses may collapse when the siphon begins. Also do not use a tap with a decorative brass finish. Bleach will discolor brass.

7. Use gloves and goggles when pouring and mixing bleach solutions. Dilute a suitable quantity of bleach (see Table 1, below) in the two-to-five gallon plastic bucket. The bleach solution may damage fabrics and other surfaces, so be sure to not splash or overflow the bucket. The actual amount of bleach to use is dependent upon the size of the hot water tank and the amount of time that can be dedicated to the process. In general, if you create a 250 ppm solution of sodium hypochlorite in the hot water tank and plumbing, it should rest for twelve hours before being purged. Table 1 provides guidelines for the amount of bleach needed to disinfect the hot water heater and associated household plumbing. Table 1 assumes that the volume of water in the hot water part of household plumbing is approximately five gallons.

Table 1: Amount of Bleach Needed to Disinfect Water Heaters of Specific Sizes, with Associated Household Plumbing

Hot Water Tank Size	Quantity of Bleach Needed
40 gallons	3¼ cups
50 gallons	4 cups
80 gallons	6 cups
120 gallons	8¾ cups

8. Place the free end of the drain hose in the plastic bucket containing the bleach solution, making sure that it reaches all the way to the bottom of the bucket.

9. This is the point in the process when having two people involved is helpful. In order to start the siphon, the drain on the heater must be opened at the same time that the hot water faucet equipped with the hose is opened. Open the hot water heater drain first, then open the hot water faucet.

10. Watch the bucket containing the bleach solution carefully. If the siphon is working properly, the level of bleach solution should be dropping as it is drawn into the hot water tank and piping. If the liquid level in the bucket is rising, turn off the hot water faucet immediately and start again. When most of the bleach solution has been siphoned out, shut the hot water tank drain, then shut the hot water tap and remove the short hose. Be sure to rinse the tap to avoid corrosion.

11. After the bleach solution has been siphoned into the hot water tank, open the cold water valve to the water heater.

12. One by one, open each of the hot water faucets in the house until you can smell bleach in the water. After water with bleach is introduced throughout the hot water system, do not use hot water faucets.

13. After at least twelve hours, drain the hot water tank to a location where it will not cause damage. Never drain water with a high concentration of bleach to the septic tank. A septic tank is dependent upon bacteria to operate properly and bleach could kill these beneficial bacteria.

14. Go to the hot water tap furthest from the water heater and let it flow for a few minutes to purge any introduced air from the system and remove any bleach from the pipes. Repeat this at each of the hot water taps until the chlorine smell goes away. Be sure to check all hot water taps to verify that all bleach has been purged from the hot water system

15. Reset the water heater thermostat.

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Additional Resources:

- Shock Chlorination: Background and Principles (FS-06-68)
- Shock Chlorination: Estimating the Amount of Bleach Needed (FS-06-69)
- A Step-by-Step Guide to Shock Chlorinating Wells and Home Water Supplies,” (FS-06-70)
- Water Testing for Private Well Owners (SP-00-02: www.unce.unr.edu/publications/SP00/SP0020.pdf)
- Matching Drinking Water Quality Problems to Treatment Methods (SP-00-19: www.unce.unr.edu/publications/SP00/SP0019.pdf)
- Drinking Water Quality in Nevada (FS-00-46: www.unce.unr.edu/publications/FS00/FS0046.pdf)



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