FACT SHEET

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

Well Disinfection

Office of Water Quality

(317) 234-7477 • (800) 451-6027 idem.IN.gov 100 N. Senate Ave., Indianapolis, IN 46204

Why disinfect a well?

Well disinfection, also called shock chlorination, can eliminate or reduce harmful microorganisms (bacteria, viruses, etc.) as well as harmless bacteria that may cause unpleasant taste and odors. Disinfection will NOT correct water problems caused by other contaminants (*i.e.*, nitrates, fuels, pesticides, toxins, or other substances).

Why should you test?

Water quality changes over time so it is important to test your well water at least once a year. You may need to sample more often based on your test results or circumstances. See the Indiana Department of Health's Private Well Water Testing brochure for more information: IN.gov/health/eph/files/Well.Water.pdf

Other factors that warrant additional, or more frequent, testing include:

- Floods
- Earthquakes (there may be delay in bacteria contamination)
- Septic failure, spill, and/or leaks
- Sanitary sewer overflow or damage
- Stagnation (water not in use due to long vacations, seasonal closures, off-site rehabilitation or hospital stays, foreclosure, etc.)
- Owner or resident concerns, such as:
    - Recurring health concerns
    - Changes in water odor, color, taste
    - Property transfers
- If the well has been disinfected:
    - Re-test after the last trace of chlorine odor has dissipated, usually 7–10 days after disinfection.
    - Follow up with two additional water tests, one in 2–4 weeks and another 3–4 months after disinfection to ensure that any issues do not return.
    - If test results show the presence of any coliform bacteria, repeat the well disinfection process and test again. Contact your county health department for assistance if tests continue to show the presence of bacteria.

Contact the **Indiana Department of Health (IDOH)** or your **county health department** with questions about testing.

When should you disinfect?

- After flooding, especially if the water goes over the top of the well cap/well seal.
- Any time the well cap/well seal is opened.
- Any time the well is damaged (*i.e.,* accidents, tornados, earthquakes, etc.).
- After a period of stagnation (*i.e.,* water not being used due to long vacations, seasonal closures, off-site rehabilitation or hospital stays, foreclosure, etc.).
- After a positive test for bacteria (*i.e.,* total coliform, E. coli, or fecal coliform).

IDEM recommends hiring a licensed plumber, licensed water well driller, or licensed water well pump installer who is familiar with the process to perform the well disinfection. This can increase the probability of effective disinfection. It is especially important to have a professional perform disinfection if the pH of the well is not ideal for chlorination. Usually, the pH will need adjusted because of Indiana's geology.

Note that under Indiana Code 25-39 a licensed water well pump installer is the only person allowed to install or repair water well pumping equipment.

If you have questions, concerns, and/or are not having success contact one of the following to help trouble shoot and answer questions:

- Indiana Department of Health (IDOH) and your county health department
- Indiana Department of Natural Resources (IDNR)
- Great Lakes Community Action Partnership (GLCAP)

Safety Precautions

Should you decide to shock chlorinate your well yourself take the following safety precautions:

- ELECTRICAL
  Use EXTREME CAUTION as you will be working with electricity and water!
  - Prevent electric shock from the water well pump. Turn off power to the well pump circuit breaker before removing or replacing the well cap/well seal, not the main circuit breaker.
    - Step 2 turn power off, Step 6 turn power on, Step 8 turn off while returning well cap/well seal then turn back on.
  - While the power is off, examine for chaffed wire insulation or missing wire nuts and repair as necessary.
  - Wear rubber soled shoes or boots, preferably waterproof.

- CHEMICAL
  - Severe eye damage may result from contact with chlorine, including bleach and highly chlorinated household water! Follow manufactures labeling and use warnings including use of personal protective equipment that could include wearing gloves, goggles, an apron, etc.
  - NEVER put undiluted bleach into a water well.
    - Bleach can react with well components and natural occurring minerals found in groundwater with unpredictable results.
  - High chlorine levels in water during the shock chlorination process.
    - Arrange for an alternative source of drinking water. Make sure that no one, especially children and older adults, do not consume tap water during process. If you have the option, consider staying somewhere else during this time.

- RESPIRATORY
  - DO NOT ENTER WELL PITS! Death can occur in even a shallow well pit. Refer disinfection of wells in pits to licensed water well driller or licensed water well pump installer.
    - Well pits pose an extreme hazard as they frequently contain a build-up of toxic gases or simply lack sufficient oxygen to sustain life!
  - If your well has radon, methane, ammonia, or any other gases or volatile compounds it can cause unintended chemical reactions that may be harmful. If the well is in a wellhouse the structure should be well ventilated.
  - Proper ventilation while disinfection is left in internal plumbing lines for the home or building.

Materials

- ☐ Your water well log to determine well depth.
  - If you don't have a copy of your water well log, check IDNR's Water Well Viewer website https://indnr.maps.arcgis.com/apps/webappviewer/index.html?id=4b4f37e1dde744ce865e1be4d157ac93
- ☐ Personal protective equipment such as gloves, goggles, rubber boots, apron, etc.
  - *See safety precautions.*
- ☐ Sodium hypochlorite (NaOCl) also known as:

  chlorine household or laundry bleach (5.25% chlorine)

  or

  hypochlorite granules (70% chlorine).
  - DO NOT USE scented/fragranced products, gels, or pool/spa chemicals.
  - The chlorine/bleach odor of product is helpful indicator to know if the chlorine mixture is present during the disinfection process.
  - Ensure that the product is new and unopened or sealed product to ensure that the product is unaltered and has not been mixed or swapped for something else.
  - Never pour bleach directly down a well.
- ☐ Chlorine test strips (such as those commonly used in restaurants to check chemical sanitizing dishwashers) are not necessary but will provide a visual indication that chlorine is present.
- ☐ A clean plastic tarp or trash bag on which to set well components during the disinfection.
- ☐ A clean bucket/pail to mix the chlorine solution.
- ☐ A clean funnel to pour the chlorine solution into the well.
- ☐ A garden hose that can reach from your well casing to an outside spigot/tap.
- ☐ Extra water for drinking and cooking while the system is being disinfected.
  - If you have the option, consider staying somewhere else during this time.
- ☐ A phone to call if in need of help or in case of emergency.

Steps to Disinfect Well

- **Step 1 – Bypass and isolate critical areas**

  Critical areas **may be a source of contamination**. It is equally important to disinfect any appliance or equipment and associate water lines that water encounters. Critical areas may include:

  - Water softeners
  - Water heaters*
  - Water filters
    - Point of use (*i.e.*, faucets, fridge, and shower heads)
    - Whole house units
  - Other critical areas may include:
    - Pressure tanks
    - Humidifiers, dehumidifiers
    - Livestock and irrigation
    - Bait tanks

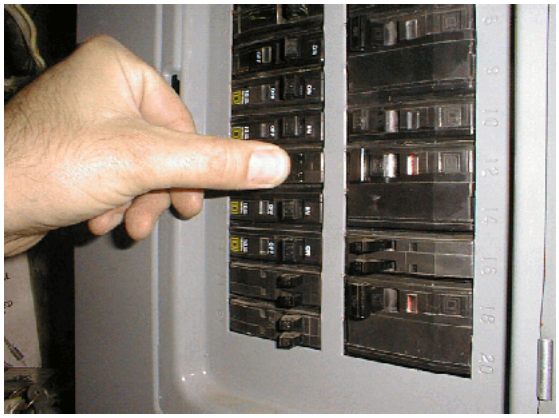
  Disinfection of critical areas follow a different process from what is described in this document. Critical areas may be damaged by excessive amounts of chlorine but the critical areas themselves should be chlorinated when there are bacteria problems.

  - Follow the manufacturer's recommendations to **bypass critical areas.** This normally requires turning knobs or pushing switches.
    - Keep critical areas on bypass until the chlorine is flushed out of the system.
  - Follow the manufacturer's recommendations to **disinfect critical areas**. If you do not have the manufacturer's instructions for disinfection, reach out to a water treatment professional (*i.e.*, water softener vendor).
    - Replace any filters with new ones after disinfection is complete.

  * Turn off the hot water heater's heating element during disinfection. If you elect to drain the water heater to remove chlorine, turn off the electricity or gas to the heater. Otherwise, the heater will be damaged when the water recedes from the heating elements or burner. Water heaters take a long time to flush chlorine after it has been introduced and may need to be flushed multiple times.

- **Step 2 – Electrical**

  - Turn off electrical power to the well pump at the circuit breaker. If present, use the circuit breaker box's hasp/latch and a lock to secure the circuit breaker and prevent someone from accidentally turning on the well pump (*i.e.*, lockout tagout). A licensed electrician can assist in disconnecting power to the well pump.



- **Step 3 – Remove the well cap/well seal**

  - With electrical power off, remove the well cap/well seal, lift the wires/wire nuts, and set them aside on a sterile surface (*i.e.*, a clean, unused trash bag or plastic tarp). The Water Systems Council published an interactive well diagram at https://www.watersystemscouncil.org/water-well-help/well-diagram/ that may be helpful in identifying the parts of your well.

- **Step 4 – Mixing the chlorine solution***
  - Determine the depth of your well using your well log. *Refer to the materials list above.*
  - Add 3 cups (24 ounces) of chlorine household or laundry bleach (5.25% chlorine) to a clean pail with about 3 gallons of water. This is generally sufficient to disinfect a 4-inch diameter well that is 100 feet deep or less.
    - For wells deeper than 100 feet, increase the amount of bleach proportionately. To determine the amount of water in the well, multiply the gallons of water per feet by the number of feet of water in the well using the table below.
    - For each 100 gallons of water in the well use the amount of compound listed:
      - Chlorine household or laundry bleach (5.25% chlorine): 3 cups (24 ounces)

        or
      - Hypochlorite granules (70% chlorine): 2 ounces (2 tablespoons) pre dissolve the tablets before putting in the well.

Use the following formula to calculate the specific ratio for your well.

1st Use the diameter of your well to determine the $\frac{\text{gallons}}{\text{feet}}$ ratio.

- 4 inch diameter well = 0.65 $\frac{\text{gallon}}{\text{feet}}$
- 5 inch diameter well = 1.00 $\frac{\text{gallon}}{\text{feet}}$
- 6 inch diameter well = 1.50 $\frac{\text{gallon}}{\text{feet}}$
- 8 inch diameter well = 2.60 $\frac{\text{gallon}}{\text{feet}}$
- 10 inch diameter well = 4.10 $\frac{\text{gallon}}{\text{feet}}$
- 12 inch diameter well = 6.00 $\frac{\text{gallon}}{\text{feet}}$

2nd Use the depth of your well to calculate the volume of water in the well.

_____ $\frac{\text{gallon}}{\text{feet}}$ × _____ feet deep well = _____ gallons of water in well

3rd Calculate the amount of chlorine needed to disinfect your well.

× 3 cups (*24 ounces*) of either chlorine household or laundry bleach (5.25% chlorine)

or

2 tablespoons (*2 ounces*) of hypochlorite granuels (70% chlorine)

÷ 100 gallons of water = _____ cups (_____ *ounces*) of either chlorine household or laundry bleach (5.25% chlorine)

or

_____ tablespoons (_____ *ounces*) of hypochlorite granuels (70% chlorine)

4th In a 5-gallon bucket mix 3-gallons of water with either

* Double-check the chlorine product before mixing solution. Make sure the product is the concentration needed and is unaltered. It is best to use a new/sealed unopened container to ensure it has not been diluted or altered.

- **Step 5 – Add chlorine to the well**
  - Pour the mixture* into the well. A clean funnel may be helpful.

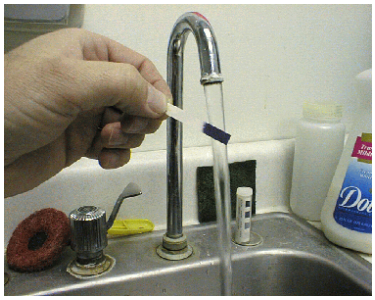
* Never pour bleach directly into the well. Follow instructions in Step 4.

- Step 6 – Recirculate chlorinated water
    - Connect one end of a garden hose to an outdoor spigot/tap (that is part of the well's water system) then run the other end of the garden hose out to your well and put it into the well casing.
    - Turn on power to the well pump.
    - Turn on/open the water spigot/tap and let the water flow into the well casing to recirculate water. Recirculating chlorinated water* helps wash the sidewalls of the well casing, mix the water column thoroughly, and distribute the chlorine.
        - Recirculate for approximately 30 minutes (new wells may need only 10-20 minutes; wells with excessive mineral build up may need up to two hours) from the time you smell chlorine from the garden hose.

  * Water coming from the garden hose may turn a reddish color due to chlorine precipitating iron in the water when you first turn on the hose. If the water appears excessively red and cloudy from this reaction, discharge the hose outside of the casing until the water runs clear.

- **Step 7 – Draw the chlorine solution to each faucet**
    - To disinfect the entire plumbing system, turn on/open each faucet* one at a time until you smell bleach (or use chlorine test strips**) while water is circulating (Step 6). Then turn off/close the faucet. Do this for each faucet or water-using appliances, including:
        - Hot and cold water taps
        - Toilets, shower, and bath fixtures
        - Any outside faucets, spigots, or yard hydrants
        - Dishwasher (run one cycle while empty)
        - Washing machine (run one cycle while empty)
        - Coffee makers and ice machines

        See Step 1 for bypassing critical areas such as things connected to a water filter.



  * Faucet aerators may need to be removed. Plumbing grit and precipitated minerals may form when chlorine is added to the system. This grit can cause clogging. Contact a licensed plumber if additional problems arise.

  ** Chlorine test strips, such as those commonly used in restaurants to check chemical sanitizing dishwashers, are not necessary but provide a visual indication that chlorine is present.

- **Step 8 – Let the chlorinated water set**
    - Turn off the well pump at the circuit breaker and return the well cap/well seal or put the cover in place.
    - Power for the well pump can be turned on when the well cap/well seal or cover are in place.
    - Let system set **12–24 hours** with chlorine in the water lines to allow time for the chlorine to kill bacteria.
        - During this time, ensure no one uses the water from your well for any purpose (*i.e.*, showers, bathing, drinking, cooking, etc.).
        - Try to limit toilet flushing during this time.

- **Step 9 – Removing the chlorinated water**
  - To flush the system, connect a garden hose to an outside spigot/tap and run the water until you no longer smell chlorine in the water coming from the hose (or use chlorine test strips to confirm there is not chlorine present). Failure to flush chlorine from all areas and plumbing fixtures could result in corrosion to your water system.
    - Run the water to an open outdoor area where the chlorine vapors can freely disperse (volatilize off) and will not build up.
    - Chlorine kills vegetation so direct the water to an area where plants will be unharmed.
    - Do not run the water into your septic system. The amount of water required to flush the system may overload the septic system and chlorine can kill the bacteria needed for septic system to work.
    - If the water smells of chlorine (or there the chlorine test strip still indicates the presence of chlorine), repeat the flushing process.
  - When the chlorine smell is gone, run the water through the remaining plumbing lines as you did in Step 7.

- **Step 10 – Follow-up water testing**
  - Re-test the water **7–10 days** after the last trace of chlorine odor has dissipated. This will ensure a valid test result.
    - Total chlorine must be absent prior to taking water samples for coliform analysis. Any amount of chlorine left in the system may result in a false negative coliform test.
  - Coliform bacteria may regrow in the water system after approximately one month. Therefore, it is important to follow up with two more water tests, one in the next **2–4 weeks** and another in **3–4 months** to ensure that the issue has not returned.
  - If coliform bacteria are detected again, disinfect the well using the same procedure. If tests continue to show the presence of bacteria, contact your county health department for assistance.