**Ohio Department of Health**
**Bureau of Environmental Health**
**Private Water Systems**

**"To protect and improve the health of all Ohioans"**

# Disinfection Fact Sheet for Drinking Water Wells

## *Simple Procedures for Homeowners*

***Revised September 2012***

**The following well disinfection procedures may be carried out by homeowners on an existing well. Disinfection is performed after the well is sampled and found to be either coliform positive when a presence/absence test was done, greater than the acceptable level of four colony forming units (CFUs) for total coliform, or is *E. coli* is present. A total coliform bacteria sample is used as an indicator of cleanliness of the well. *E. coli* is used to determine the sanitary condition of a well. The Ohio Department of Health set new microbiological standards for private water systems through the revisions of the Private Water Systems rules effective April 1, 2011. These standards are summarized in the Microbiological Standards for Private Water Systems in Ohio fact sheet.**

**Prior to beginning this procedure you may want to consider doing a resample of the well for coliform bacteria in case there was possible sampling error (remember to keep your fingers out of the sample bottle).**

**This disinfection procedure can also be followed when the presence of large numbers of non-pathogenic bacteria such as slime formers or iron bacteria have been identified. Do not attempt this disinfection procedure on your own if the well borehole conditions are potentially unstable as a collapse of the well is possible. Be aware that this procedure could also potentially damage old corroded plumbing.**

**If total coliform or *E. coli* positive samples persist after disinfection, then an experienced registered private water systems contractor should be contacted to professionally disinfect you're well using enhanced disinfection methods and the construction of the well should be evaluated.**

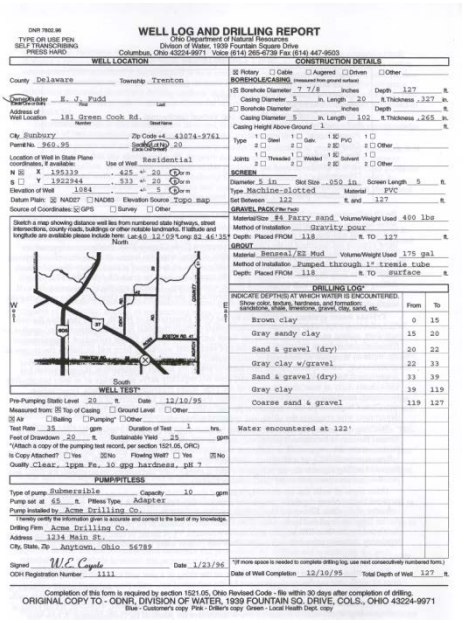
## Step 1. Pump the well

Turn on at least one outside spigot and run the water for several hours (24 hours if possible) to waste in the yard or other drainage way. The well should be heavily pumped to completely flush the well borehole and the geologic formation that supplies the water. If you have a low yielding well, be careful not to pump so hard that the pump runs dry (as this could damage the pump). You may want to consider re-sampling your well for total coliform after pumping because in some cases heavy pumping can result in an acceptable total coliform result. Do **not** discharge this water to the septic system, as it will cause the system to become overloaded.

## Step 2. Determine the total volume of water stored in your well.

The volume of chlorine used for disinfection depends on the total volume of water stored in the well casing and the distribution lines (plumbing). The total volume of water stored in the well casing can be calculated based on the total depth of the well and the static water level in the well. Information on the total depth and static water level (water level under non-pumping conditions) of the well can be obtained from the well log. The well log is a record of the construction, depth and geologic material encountered in the well and is filled out by the water well driller. After the well is drilled, copies of the well log are filed with the Ohio Department of Natural Resources (ODNR), Division of Water, the local county health department, and a copy is provided to the well owner. If you do not have a copy of your well log, search the ODNR website at http://www.dnr.state.oh.us/water/maptechs/wellogs/appNEW/ or contact ODNR, Division of Water at (614) 265-6740. The total depth of the well will be recorded at the right side of the well log, and the static water level will be recorded under the well test section of

the well log. Subtract the static water level from the total depth of the well to determine the total feet of water held in the well casing.



WELL LOG AND DRILLING REPORT
Ohio Department of Natural Resources
Division of Water, 1939 Fountain Square Drive
Columbus, Ohio 43224-9971 Voice (614) 265-6739 Fax (614) 447-9503

WELL LOCATION
County Delaware Township Trenton
Owner/Builder R. J. Fudd
Address of Well Location 181 Green Cook Rd.
City Sunbury Zip Code+4 43074-9761
Permit No. 960.95 Completed Date 10
Location of Well in State Plane coordinates, if available: Use of Well Residential
N X 195339 .425 +/- 20 ft
E Y 1922944 .533 +/- 20 ft
Elevation of Well 1084 +/- 5 ft
Datum Plain: NAD27 NAD83 Elevation Source Topo map
Source of Coordinates: GPS Survey Other
Sketch a map showing distance well lies from numbered state highways, street intersections, county roads, buildings or other notable landmarks. If latitude and longitude are available please include here: Lat 40 12'09 Long 82 46'35
North
South

WELL TEST*
Pre-Pumping Static Level 20 ft. Date 12/10/95
Measured from: Top of Casing Ground Level Other
Air Bailing Pumping* Other
Test Rate 35 gpm Duration of Test 1 hrs.
Feet of Drawdown 20 ft. Sustainable Yield 25 gpm
*Attach a copy of the pumping test record, per section 1521.05, ORC)
Is Copy Attached? Yes No Flowing Well? Yes No
Quality Clear, 1ppm Fe, 10 gpg hardness, pH ?

PUMP/PITLESS
Type of pump Submersible Capacity 10 gpm
Pump set at 65 ft. Pitless Type Adapter
Pump Installed by Acme Drilling Co.
I hereby certify the information given is accurate and correct to the best of my knowledge.
Drilling Firm Acme Drilling Co.
Address 1234 Main St.
City, State, Zip Anytown, Ohio 56789
Signed W.E. Coyote Date 1/23/96
ODH Registration Number 1111

CONSTRUCTION DETAILS
Rotary Cable Augered Driven Other
BOREHOLE/CASING (measured from ground surface)
Borehole Diameter 7 7/8 inches Depth 127 ft.
Casing Diameter 5 in. Length 20 ft. Thickness .327 in.
Borehole Diameter inches Depth ft.
Casing Diameter 5 in. Length 102 ft. Thickness .265 in.
Casing Height Above Ground 1 ft.
Type Steel Galv. PVC Other
Joints Threaded Welded Solvent Other
SCREEN
Diameter 5 in Slot Size .050 in Screen Length 5 ft.
Type Machine-slotted Material PVC
Set Between 122 ft. and 127 ft.
GRAVEL PACK (Filter Pack)
Material/Size #4 Parry sand Volume/Weight Used 400 lbs
Method of Installation Gravity pour
Depth: Placed FROM 118 ft. TO 127 ft.
GROUT
Material Bensal/BZ Mud Volume/Weight Used 175 gal
Method of Installation Pumped through 1" tremie tube
Depth: Placed FROM 118 ft. TO surface ft.

DRILLING LOG*
INDICATE DEPTH(S) AT WHICH WATER IS ENCOUNTERED.
Show color, texture, hardness, and formation: sandstone, shale, limestone, gravel, clay, sand, etc.

| | From | To |
|---|---|---|
| Brown clay | 0 | 15 |
| Gray sandy clay | 15 | 20 |
| Sand & gravel (dry) | 20 | 22 |
| Gray clay w/gravel | 22 | 33 |
| Sand & gravel (dry) | 33 | 39 |
| Gray clay | 39 | 119 |
| Coarse sand & gravel | 119 | 127 |
| Water encountered at 122' | | |

*(If more space is needed to complete drilling log, use next consecutively numbered form.)
Date of Well Completion 12/10/95 Total Depth of Well 127 ft.

Completion of this form is required by section 1521.05, Ohio Revised Code - file within 30 days after completion of drilling.
ORIGINAL COPY TO - ODNR, DIVISION OF WATER, 1939 FOUNTAIN SQ. DRIVE, COLS., OHIO 43224-9971
Blue - Customer's copy Pink - Driller's copy Green - Local Health Dept. copy

## Step 3. Determine the volume of chlorine to use for disinfection

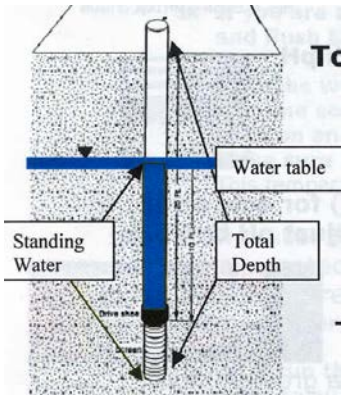
Once the total feet of water stored in the casing is known, then the volume of water stored in the casing can be calculated based on Table 1. Take the total feet of water stored in the well, and based on the well diameter, multiply the total feet times the appropriate gallons per foot of water.

*Example:*

*Total well depth is 100 feet, static water level is 60 feet, well casing diameter is 5 inches.*
*100 feet – 60 feet (static water level) = 40 feet of water in the well casing*
*From Table 1, a 5 inch casing has 1 gallon stored per foot.*
*40 feet of water in the casing x 1 gallon per foot = 40 gallons volume of water in casing*

| Table 1. Volume of water in well | |
|---|---|
| Diameter of well (inches) | Gallons per foot of water |
| 3 | 0.37 |
| 4 | 0.65 |
| 5 | 1.0 |
| 6 | 1.5 |
| 8 | 2.6 |

The total volume of chlorine to be used for disinfection can be calculated based on the Table 2. For the example cited above (40 gallons of water in the well casing), use approximately one-half of the amount of chlorine necessary to disinfect 100 gallons.




| Table 2. Amount of chlorine added to **100 gallons of water** for disinfection | | | |
|---|---|---|---|
| Chlorine concentration (parts per million) | Gallons of 5.25% sodium hypochlorite - liquid bleach | Pounds of dry calcium hypochlorite | Minimum contact time |
| 100 | 0.25 gallons (4 cups) | 0.2 | 8 hours |
| 150 ppm | .4 gallons (6.5 cups) | 0.4 pounds | 8 hours |

If the total volume of water stored in the well casing is unknown, add ½ to 1 gallon of fresh 5.25 % unscented laundry bleach, also called sodium hypochlorite, to five gallons of water and three gallons vinegar.

## Step 4. Precautions to take before disinfecting the well.

Do not to consume the water during the disinfection treatment process. Arrange for an alternative source of drinking water.

If you are not comfortable working with chemicals, the well disinfection should be performed by a registered private water systems contractor. Please follow all directions and warnings for the chemical products used. Always use rubber gloves, eye protection, and protective clothing when handling mild acids and chlorine products (such as bleach). Avoid contact with the mild acids and

chlorine products. If you should splash chlorine or acid solutions on your person or clothing, immediately rinse thoroughly with water. If you are using purchased well cleaning products, be sure to follow the manufacturer's recommendations for personal protection and safety.

**Step 5. Prepare a vinegar and chlorine solution**.

Use about three parts white vinegar to one part 5.25% chlorine to lower the pH for better disinfection. Mix the vinegar with five gallons of water then add the amount of chlorine that was determined to be needed in Step 3.

Mix the solution in a new clean garbage can, or clean and line a garbage can with a new plastic garbage bag. Laundry bleach loses its' effectiveness the longer it sits on the shelf in the store or in your home. Do not use bleach with fragrance additives. Solid chlorine pellets, which are 65% to 70% calcium hypochlorite, should be dissolved in five gallons of water. Use only chlorine pellet products intended for water well disinfection. Do not use solid chlorine products used for swimming pools because they may contain additional chemicals, such as algaecides. If your water has a lot of dissolved calcium, do not use calcium hypochlorite because it may cause clogging of the well borehole.

**Step 6. Add the chlorine / vinegar solution to the well**

Remove the cap from the well. Place the can next to the well to pour the solution or siphon the chlorine /vinegar solution from the can directly into the well. Ideally the vinegar should be added to the well bore first through a 1 inch plastic line then followed with the chlorine solution to provide a better opportunity for complete disinfection.

**Step 7. Flush and re-circulate**.

*By-pass all water treatment units during the initial chlorination process to avoid damage to the resin bed.* The resin bed of the water softener can provide a place for bacteria to grow, and must be chlorinated at lower concentrations. The water softener should be disinfected separately using ¼ to ½ cup of chlorine bleach placed into the small fill tube in the large brine tank followed by a manual recharge. Please check with the manufacturer of the water softener or any treatment device regarding proper procedures or requirements during system disinfection. Remove and discard any carbon filters or cartridge filter elements and thoroughly clean the inside of the filter housing.

With a garden hose, re-circulate this solution back into the well washing down the sides of the casing for approximately ten minutes. Debris may begin to slough off the side of the casing, and iron or manganese in the water may begin to turn solid as the chlorine reacts with the minerals. Run the well to waste outside long enough and hard enough to reduce the debris that has come loose before you run anything inside the house - especially the washing machine. You may need to re-treat the well with another vinegar and chlorine solution before continuing to the next part of Step 6.

After the water has run clear for a while turn on **all** faucets connected to the well throughout the house and outside the house, including the hot water faucets. Make sure to turn on faucets that rarely or never get used, especially yard hydrants and outside spigots. Remember to run water into the washing machine and flush all toilets. Run the water until the chlorine smell is detected.

## Step 8. Maintain sufficient contact time.

Once the odor of chorine is detected in all water lines, shut off the faucets and let the water sit in the plumbing for 8 to 24 hours.

## Step 9. Flush the chlorine from the water system.

After sufficient contact time has elapsed, run the water to waste until the entire odor of chlorine is gone. This will take a while depending on the volume of the well and the plumbing. Do **not** run the water into your septic system as this will cause the system to become overloaded.

## Step 10. Retest the well for total coliform

Wait a few days, and then contact the local health district to have another sample collected for total coliform bacteria. Make sure that the water is checked for chlorine before collecting the water sample. If there is any indication of chlorine in the water, the sample should not be collected. This helps avoid getting an indication of a safe sample that may be due only to the continuing activity of leftover chlorine and may not reflect the true condition of the water. Do not replace carbon filters or filter elements until an acceptable total coliform result has been achieved.

## What if the well has unacceptable levels of total coliform after disinfection?

There are many instances where the previously described disinfection procedures may not work sufficiently in reducing the levels of bacteria in the water well. In some cases the pH of the water may need further adjustment in order to get the optimum disinfection from the added chlorine, or enhanced disinfection methods may be required. The well casing may also need a thorough scrubbing or cleaning to remove non-pathogenic slime forming or iron bacteria that can build up on the well casing and borehole walls. Removal of this type of bacteria often requires the use of specially formulated well cleaning products and cleaning equipment and is best performed by a registered contractor. If total coliform levels persist above four colony forming units (CFUs), if *E. coli* bacteria persist in water samples, or the condition and stability of the well is questionable, then contact an experienced registered private water systems contractor (http://www.odh.ohio.gov/odhprograms/eh/water/PrivateWaterSystems/List-of-PWSContractors.aspx) to professionally disinfect your well. Persistent bacteria problems may also indicate that your well has deteriorated or that there is an existing issue with the aquifer. Contact your local health district when you experience any problems with your well or for additional assistance on private well issues.

*The Ohio Department of Health registers and bonds private water systems contractors. Please contact your local health district or check for the most current list of registered contractors and other information at the Ohio Department of Health's Private Water Systems Program by going to* http://www.odh.ohio.gov/odhprograms/eh/water/PrivateWaterSystems/main.aspx*.*

**Questions?**

**Private Water Systems Program**
**Bureau of Environmental Health**
**Ohio Department of Health**
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**(614) 644-7558**
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