

**Missouri Department of Natural Resources
Water Protection and Soil Conservation Division
Public Drinking Water Program**

**PROCEDURES FOR
FLUSHING, DISINFECTING, AND TESTING
SEASONAL PUBLIC DRINKING WATER SUPPLIES**

Use the following practices and procedures before serving water to the public after any part of your water system has been shut down during the off season.

Flushing:

Water that has been standing in pipes or pressure tanks for long periods of time can build up and harbor large populations of bacteria, therefore, it is important to flush out the stale, stagnant water. This can be accomplished by flushing all the piping. The water should be flushed until you are certain all the stagnant water has been removed. After the initial flushing, the system should be disinfected.

If the supply has full-time disinfection, flushing the mains and then establishing a chlorine residual in all parts of the distribution system should suffice.

Disinfection Procedure:

Sodium hypochlorite solution (commercial strength or unscented common liquid laundry bleaches) or calcium hypochlorite (HTH) may be used as disinfectants for a well. The disinfectant needs to be of such volume and strength and should be applied so that a concentration of at least 50 mg/l of available chlorine is obtained for the entire depth of the well. Use the following table and sample calculations to calculate the proper amount of chlorine solution to be applied. **Once you have determined the proper amount of chlorine, add it to approximately three (3) gallons of water.** Then pour the chlorine and water mixture into the well. Connect garden hose to nearby faucet and wash down inside of well. Use buckets of clean water if garden hose isn't available.

After this has been accomplished, go to each faucet and turn the water on until you can detect the presence of chlorine. If strong odor is not detected, add more chlorine to the well. As soon as strong odor of chlorine is detected, turn the water off and go to the next faucet and repeat the task for each faucet throughout the system. **Let the chlorinated water stand in the pipes and faucets for 24 hours.** After 24 hours, starting with the faucets nearest the well (including outdoor faucets), flush the water until the distinctive chlorine odor disappears. Repeat this task for each faucet, flushing outward from the well, until you have flushed all of the faucets.

TABLES

Pre-calculated amount of Chlorine (laundry bleach 5.25%Chlorine) to add to well to produce 50 mg/L Chlorine for disinfecting and flushing lines

Depth of water in Well	Casing Diameter			
	4 inches	6 inches	8 inches	10 inches
10 feet	1/2 cup	1/4 cup	1/2 cup	1 cup
25 feet	1/4 cup	1 cup	1 cup	2 cups
50 feet	1/2 cup	1 1/2 cups	2 cups	3 1/2 cups
100 feet	1 cup	2 1/2 cups	4 1/2 cups	6 1/2 cups
200 feet	2 cups	5 cups	8 1/2 cups	13 1/2 cups

Note: 16 cups in a gallon

If you need to calculate the amount of Chlorine, you may use the following tables and examples:

MATERIAL	% CHLORINE IN MATERIAL	AMOUNT TO ADD PER 1000 GAL. TO PRODUCE 50 mg/L CHLORINE
SODIUM HYPOCHLORITE (LIQUID LAUNDRY BLEACHES SUCH AS CLOROX OR PUREX)	5.25	1 gallon
SODIUM HYPOCHLORITE (COMMERCIAL STRENGTH)	12	7 cups (16 cups = 1 gallon)
CALCIUM HYPOCHLORITE (HTH Perchloron, etc.)	70	1 1/8 cups

TO DETERMINE AMOUNT OF WATER IN WELL				
DIAMETER OF WELL (in inches)	4	6	8	10
GALLONS OF WATER (per foot of depth)	0.65	1.5	2.6	4.1

Examples

To disinfect a 6-inch diameter well that has a water depth of 235 feet using a liquid bleach (Clorox or Purex)
 $(1.5 \text{ gal/ft} \times 235 \text{ ft})(1 \text{ gal}/1000 \text{ gal}) = 0.35 \text{ gal}$ or 1/3 gal of clorox.

To disinfect a 6-inch diameter well that has a water depth of 235 feet using Sodium Hypochlorite (commercial strength)

$$(1.5 \text{ gal/ft} \times 235 \text{ ft})(7 \text{ cups}/1000 \text{ gal})=2.46 \text{ cups of Sodium Hypochlorite}$$

To disinfect a 6-inch diameter well that has a water depth of 235 feet using Calcium Hypochlorite (HTH)

$$(1.5 \text{ gal/ft} \times 235 \text{ ft})(1 \text{ } 1/8 \text{ cups}/1000 \text{ gal})=0.397 \text{ cups of Calcium Hypochlorite}$$

Testing --- Special Samples:

After the system has been flushed and disinfected, it is a good idea to send in a "SPECIAL"

water sample for analysis. Special samples do not count toward compliance with the maximum contaminant level (MCL) of total coliform or the monthly bacti monitoring requirements. Special samples are used to determine if water is bacteriologically safe after main breaks, pump repairs, water line extensions, and the like. A special sample is sent in exactly like your regular routine sample, the only difference is the box marked "special" is checked instead of the box marked "routine." If the results of the special sample indicate it was safe for drinking, you are ready to go on line. Special Sampling Techniques for Coliform Analysis for proper sampling and shipping of samples for bacteriological analysis is provided in this package.

For assistance, contact your Department of Natural Resources Regional Office (see map of Department Offices).



MISSOURI DEPARTMENT OF NATURAL RESOURCES

DEPARTMENTAL OFFICES

Kansas City Area

● **Kansas City Regional Office**
500 NE Colbern Rd
Lee's Summit, MO 64086-4710
(816) 622-7000
FAX: (816) 622-7044

○ **Department of Energy
Kansas City Plant / DNR - AIP**
2000 E. Bannister Rd.
P.O. Box 410202
Kansas City, MO 64141-0202
(816) 997-5790
FAX: (816) 997-3261

○ **Kansas City Satellite Office**
4750 Troost Avenue
Kansas City, MO 64110
(816) 759-7313
FAX: (816) 759-7333

○ **Northwest Missouri Satellite Office**
Northwest Missouri State University
Environmental Services, 800 University Drive
Maryville, MO 64468-6015
(660) 582-5210 or (660) 582-5290
FAX: (660) 582-5217

Northeast Area

● **Northeast Regional Office**
1709 Prospect Dr.
Macon, MO 63552-2602
(660) 385-8000
FAX: (660) 385-8090

Northeast Area (continued)

○ **Mississippi River Project Office**
Wakonda State Park
Rt 1 Box 242
LaGrange, MO 63448
(573) 655-4178
FAX: (573) 655-8852

St. Louis Area

● **St. Louis Regional Office**
7545 S. Lindbergh, Ste 210
St. Louis, MO 63125
(314) 416-2960
FAX: (314) 416-2970

○ **Franklin County Satellite Office**
Meramec State Park
Hwy 185 S.
Sullivan, MO 63080
(573) 860-4308
FAX: (573) 468-5051

○ **Hazardous Waste Field Office**
917 N. Hwy 67, Ste. 104
Florissant, MO 63031
(314) 877-3250 or 3251
FAX: (314) 877-3254

○ **Jefferson County Satellite Office**
Eastern District Parks Office
Hwy 61
Festus, MO 63028
(636) 931-5200
FAX (636) 931-5204

St. Louis Area (continued)

○ **Lincoln County Satellite Office**
Cuivre River State Park
678 State Rt. 147
Troy, MO 63379
(636) 528-4779
FAX: (636) 528-5817

Southeast Area

● **Southeast Regional Office**
2155 North Westwood Boulevard
Poplar Bluff, MO 63901
(573) 840-9750
FAX: (573) 840-9754

● **Division of Geology and Land Survey**
111 Fairgrounds Rd.
P.O. Box 250
Rolla, MO 65402
(573) 368-2100
FAX: (573) 368-2111

○ **Delta Center Satellite Office**
P. O. Box 160
Portageville, MO 63873
(573) 379-5431
FAX: (573) 379-5875

○ **Rolla Satellite Office**
111 Fairgrounds Rd.
Rolla, MO 65402
(573) 368-3185
FAX: (573) 368-3912

Southwest Area

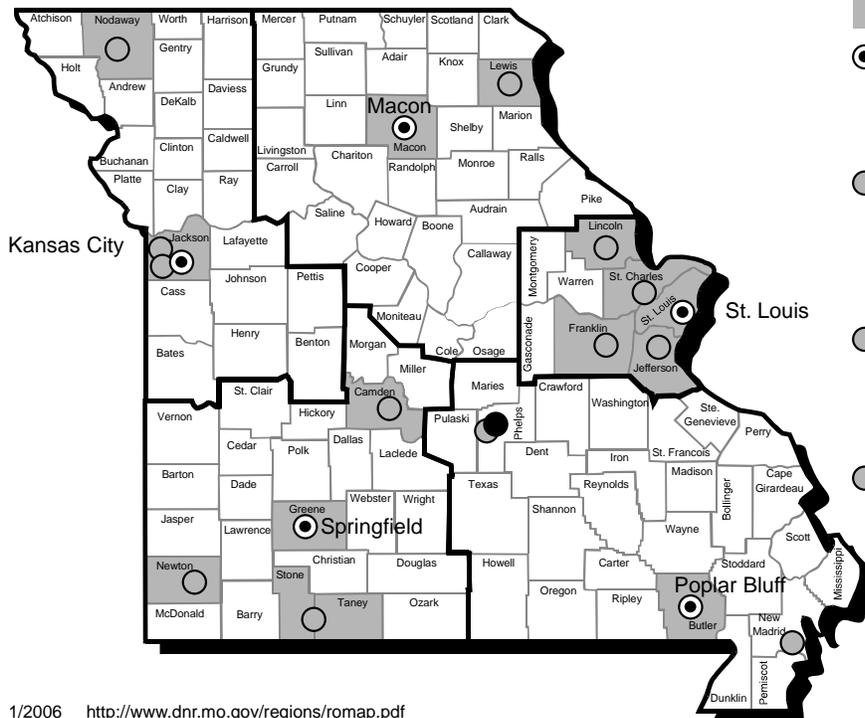
● **Southwest Regional Office**
2040 W. Woodland
Springfield, MO 65807-5912
(417) 891-4300
FAX: (417) 891-4399

○ **Lake of the Ozarks Satellite Office**
Camden County, 5568 A Hwy 54
Osage Beach, MO 65065
Mailing address:
2040 W. Woodland
Springfield, MO 65807-5912
(573) 348-2442
FAX: (573) 348-2568

○ **Neosho / Joplin Area Satellite Office**
1900 S. 71 Highway
Neosho, MO 64850
(417) 455-5155
FAX: (417) 455-5157
Mailing address: 2040 W. Woodland
Springfield, MO 65807-5912

○ **Taney / Stone County Satellite Office**
Table Rock State Park
5272 State Hwy 165
Branson, MO 65616
(417) 337-9732

For more information on
the department, visit
www.dnr.mo.gov
call 1-800-361-4827
or write to
P.O. Box 176
Jefferson City, MO 65102-0176.



1/2006 <http://www.dnr.mo.gov/regions/romap.pdf>

SAMPLE COLLECTION TECHNIQUES FOR COLIFORM ANALYSIS

Adapted From EPA's "Pocket Sampling Guide for Operators of Small Water Systems" (EPA 814-B-92-001)

For More Information

Copies of the "Pocket Sampling Guide for Operators of Small Water Systems" (EPA 814-B-92-001) on which this appendix is based are available from the Environmental Resource Information Center (ERIC). The cost is \$8.56 plus \$4.00 shipping and handling. ERIC's telephone number is 1-800-276-0462. The ERIC document number for the sampling guide is G-654.

Sample Containers

Sample bottles can be obtained from the Public Health Laboratories or by contacting the local MoDNR Regional Offices. **DO NOT OPEN BOTTLE UNTIL ALL INSTRUCTIONS HAVE BEEN READ!**

The bottles contain a chlorine neutralizer that is present in liquid or crystalline form. They are sterile and ready for use when shipped. The chlorine neutralizer stops the disinfection action of chlorine during the sample's transit to the laboratory, thus providing a more representative picture of the sample's microbial content when the sample was taken. You are sampling the water to determine what the water is like coming out of the consumer's tap at the time you took the sample, and not what it is like during transit to the laboratory. **Do not rinse contents from the container and keep bottle closed until it is to be filled (Step 8)!**

Procedures Prior to Sample Collection

The following steps describe the general procedures to prepare for collecting coliform analysis monitoring samples:

- 1. Assemble all of the sampling supplies before you begin.** The containers are sterilized, so handle them carefully. **Wash your hands thoroughly before handling supplies.**
- 2. Go to the sampling location(s) specified in the sampling plan.** Representative sampling locations are located in the distribution system and are accessible during normal business hours. Examples may include hospitals, city buildings, pump stations, and restaurants. **Examples for State Parks may include shower houses, visitor centers, restaurants, pump stations, etc.** The sample should be taken from a clean smooth-nosed cold water tap free of attachments (hoses, etc.) if possible. **If possible, avoid drinking fountains, leaky faucets, swivel neck faucets, hot-cold mixing faucets, and frost-proof hydrants since it is not practical to sterilize these fixtures.**
- 3. If possible, remove any aerators, strainers, or hoses that are present,** because they may harbor bacteria. (You may not be able to remove the aerator or find a non-swivel faucet.)
- 4. Open the cold water tap for about 2 to 3 minutes before collecting the sample.** (You may want to time this step—3 minutes is a long time.) This should adequately clear the service line.
- 5. Flame-sterilize the tap from its nose to the valve and/or chemically disinfect the tap. Do not flame-sterilize if tap is plastic or if aerators are attached.** Or, disinfect tap by thoroughly rinsing both the inside and outside of the tap with a 100 ppm sodium hypochlorite (NaOCl) solution - mix ¼ ounce (1.5 teaspoon) of household bleach with one gallon of clean water. If tap cleanliness is questionable, let solution remain in contact with tap for up to 15 minutes or increase strength (more bleach).

6. *Fill out the water analyses card in waterproof ink.* Make sure the label is dry before writing on the label.
7. *Flush the tap for an additional 2 to 3 minutes and reduce to a gentle flow to about the width of a pencil.* Check for steady flow. Do not change the water flow once you have started sampling. It could dislodge microbial growth.

Sample Collection Procedures

The following steps describe sample collection procedures for coliform analysis monitoring samples and are only to be performed if Steps 1-7 have been completed:

8. *Grasp cap along top edge and remove carefully not to touch the inside with your fingers.*

Do not rinse out the bottle before collecting the sample!

Hold the bottle in one hand and the cap in the other.

Do not lay the cap down or put it in a pocket!

Also, take care not to contaminate the sterile bottle or cap with your fingers or permit the faucet to touch the inside of the bottle.

9. *Allow gentle flowing water (pencil width) to fill bottle to the 100 ml line or to the black line present on some bottles.* Hold the bottle so that water entering the bottle will not come in contact with your hands. **Samples will not be tested if there is less than ½ inch air space in the bottle, so do NOT overfill.**

10. *Place the cap on the bottle and screw it down tightly.*

11. *Turn the tap off.* Replace the aerator, strainer, or hose.

12. *Check that the information on the label is correct.*

13. *Complete the bacteriological water analysis card* with the necessary sample collection information. **Be certain time and date are correct.**

14. *Currently, samples must reach the laboratory within 30 hours of collection.* The DHSS has a courier service available that has worked well. **Contact the PDWB for more information.**

Shipping instructions

Collect Samples only on Monday, Tuesday, or Wednesday, except in an emergency.

Samples should not be en route to the laboratory over a weekend or state holiday.

Ship samples immediately after collection. This is important because samples must be in transit no more than 30 hours. Check with your local postmaster for time of dispatch and collect the samples shortly before shipment to the laboratory. To ensure shortest shipping time, **use first class postage.**

The DHSS contact courier is also available Monday – Thursday and has worked well.

Information Form: Fill out a separate form for each water sample submitted. Supply all information requested on the form and enclose with the sample container. Be certain that the number on the form matches the number on the bottle.

Samples with incomplete collection information will NOT be tested.

**CHECKLIST FOR ASSESSING WELLS AND TANKS
FOR
SECURITY RISKS AND SANITARY DEFECTS**

Inspect your water tanks and wells regularly (as often as possible) for sanitary defects.

Sanitary defect checks and security measures that should be taken to **protect water storage tanks** include any of the following:

- Gates should be locked and secured
- Hatches and manways locked and secured (Hatches are located on top of tank)
- Hatches are properly sealed to prevent insects, birds, etc. from entering (sealed means no gaps between the hatch lid and the hatch)
- Vents are properly screened to prevent insects, birds, etc. from entering (Vent is on top of tank)
- Overflows are properly screened to prevent insects, birds, etc. from entering (Overflows typically run down the side of the tank and extend to within 24 inches of ground if properly constructed)
- Observe the tank for any possible indication of insects and/or birds by checking the vents and overflows for nests, feathers, insects, etc.
- Observe the tank for any gaps or holes anywhere on the tank (sometimes rigging holes are left on the top after maintenance and should be sealed)
- Electric warning devices are functionally operating
- Pump pits are locked
- Lighting is good
- Footprints or evidence of unauthorized activity (containers, trash, etc.)

Sanitary defect checks and security measures that should be taken to protect **wells** include any of the following:

- Well is in a locked well house
- No unnecessary chemicals
- Proper size vent is installed with hole facing downward
- Proper vent screen is installed and secure to prevent insects from entering the well
- Vent is at least 12 inches above floor and turns downward
- Wellhead is in good condition (no cracks, rust, or holes)
- Electric components are in good condition (no rust, operable)
- Lighting is good
- Evidence of unauthorized activity

Note: Increases in chlorine demand may indicate potential tank contamination or well contamination.

Professional inspection, cleaning (if needed), and maintenance to determine structural integrity, paint condition, and sanitary defects should be done on tanks every 2 to 5 years. Regional Office Drinking Water Staff may supply you with a list of inspectors.