



Center for Drinking Water Quality Enhanced Disinfection Procedure for Public Water Systems

Instructions

This is the Enhanced Disinfection Procedure for Public Water Systems. This procedure requires a higher chlorine concentration to remain in the well for a longer period than the standard disinfection procedure. Use this procedure when:

- A new well is constructed;
- A pump is removed from the well for maintenance or replacement; or
- Enhanced disinfection is required by the Rhode Island Department of Health (RIDOH) to ensure the safety of source water quality.

This disinfection procedure is not intended for public water systems that have permanently installed chlorination equipment for well disinfection.

A public water system (PWS) official must review this guidance document prior to beginning disinfection and contact RIDOH with any questions. The PWS official is required to contact a licensed well professional to disinfect according to this procedure. Follow the steps in this document and fill in all required fields on the accompanying Certification and Submission Page. When the procedure is completed, submit a signed copy of the Certification and Submission Page to RIDOH. Keep this document on file for future use and make it available for reference during state sanitary surveys.

PLEASE NOTE: If disinfecting a gravel packed well, refer to American Water Works Association (AWWA) Standard C654. If disinfecting a large storage tank, refer to AWWA Standard C652.

Disinfection Procedure

Materials

For this procedure, you will need the following:

- Personal protective equipment (rubber gloves, protective eyewear, etc.)
- A new, unopened, and unscented bottle of liquid household bleach (5.25%, 8.25%, or 12% sodium hypochlorite). Do not use bleach solids, tablets, or pellets.
- A 5-gallon bucket.
- A 16- or 32-ounce spray bottle and funnel.
- Chlorine test strips (Environmental Protection Agency [EPA]-approved test strips recommended) to verify A) the presence of chlorine in the system and B) the absence of chlorine in the system once it has been allowed to sit and been flushed.
- If possible:
 - A hose long enough to reach the well from an outdoor spigot/silcock that is only used for water (consider purchasing a hose specifically for this task).
 - NSF 61 certified food-grade silicone for gasket repair.

1. Determine alternative water source, if necessary.

The disinfection procedure will take 48-72 hours. Do not allow the water to be used for the entire duration of the procedure. If the PWS needs to serve water during this period, it must provide bottled or alternative water. You will need prior approval from RIDOH before using bulk water. See the section Using Bulk Water Haulers on health.ri.gov/PWSprepare.

2. Notify Public Water System consumers that the water cannot be used.

Post “Do Not Use” notices in all public locations. Notify PWS consumers that water cannot be used while disinfection procedure is being conducted. Notification must be posted 24 hours prior to beginning this procedure.

Download the [“Do Not Use” notice template](#) here or from health.ri.gov/PWSlicensing

3. Shut off all power to well to avoid potential electrical shock.

Shut off all power to the well. Ensure that power switches will not be inadvertently turned on. Please refer to the OSHA 29 CFR 1910.147 “lock out, tag out” procedure. **Do not turn power back on until Step 13 of this procedure**, after the chlorine solution has been placed in the well.

4. Remove and inspect well cover.

Remove the well cover/cap by removing the bolts or loosening the set screws. Be careful not to drop parts into the well.

Take photographs of the underside of the well cover and top interior of the well casing. Remove any visible insects or debris found within the wellhead. If the rubber gasket appears to be cracking or heavily worn down, replace it or repair it with NSF 61 certified food-grade silicone before the cover is reinstalled.

The well cover must have a watertight, durable, non-corrodible, vermin-proof, vented, bolted cap with a sanitary seal (gasket). Note that the vent must be downward facing and be covered by a #24-mesh screen made of stainless steel or other non-corrodible material. If the well cover or vent is found to be noncompliant at the time of disinfection, repair it or replace it.

5. Remove the pump from the well.

Note: If this is a new well and the pump has not yet been installed, this step is not applicable and can be skipped.

The pump must be removed from the well by a well professional. Record the manufacturer make/model of the well pump when the pump is pulled. If at this time it is determined the well pump will be replaced, the PWS must submit an [In-Kind Replacement form](#) (found on health.ri.gov/PWSlicensing under “Other Licensee Forms”).

When the pump is pulled, store it on a tarp or other clean surface free from any mud or debris.

6. The well professional must “sound” the well.

The well professional will sound the well by lowering a water level indicator probe into the well. The well professional must record the top of the water level **and** lower the probe to level the bottom of the well. **Note:** the water level indicator must be one that is **only** used on potable water wells. Ensure the indicator is properly sanitized before putting it into the well.

7. Create 200 mg/L chlorine cleaning solution for pump.

Note: If the well professional has a cleaning solution with a chlorine concentration of 200 mg/L (ppm) or greater, skip this step.

Otherwise, fill a 16-ounce spray bottle halfway with water. Use a funnel to add the appropriate amount of household bleach to the bottle (see table below). Fill the bottle the rest of the way with water. If using a 32-ounce spray bottle, double the amount of bleach in the table below.

Concentration of Sodium Hypochlorite in Bleach (%)	Amount of Bleach to Add to Solution (Teaspoons)
5.25%	4 teaspoons
8.25%	3 teaspoons
12%	2 teaspoons

8. Spray disinfect pump and permanent equipment.

Clean the surface of the pump, ensuring that no dirt is present on the surface. Then, spray all wetted surfaces of the pump, and any other permanent equipment to install, with the cleaning solution created in step 7.

9. Reinstall the pump.

Reinstall pump in the well. The well professional must record the depth below ground surface at which the pump has been set.

10. Determine the amount of bleach needed to dose the well with 100 mg/L chlorine solution.

Determine the appropriate amount of unscented liquid household bleach to introduce to the well. The final concentration of free chlorine in the solution should be 100 mg/L (ppm).

To determine the amount of bleach needed, refer to the attached Well Disinfection Tables (Tables A through C) or the online chlorine disinfection calculator posted on the RIDOH website, [download here](#) or from health.ri.gov/PWSlicensing

11. Mix bleach with water in a 5-gallon bucket.

Put on appropriate personal protective equipment, including but not limited to gloves and eyewear. Fill a clean 5-gallon bucket approximately halfway with water. Slowly pour the appropriate amount of bleach for your system into half-full bucket and then carefully fill the remainder with clean water.

12. Add solution to well.

Pour bleach and water solution into well making sure to cover all surfaces within the wellhead and interior of the casing. Save approximately 1/2 cup of the bleach and water solution and pour it over the inside of the well cap.

13. Recirculate the chlorinated water.

Note: If there is no hose available for recirculation, skip this step.

Run the hose from the nearest downstream tap to the well and spray or hose down the interior of the well with chlorinated water. This will recirculate disinfected water back into the well. Turn on power to the pump. Recirculate water from the tap back into the well for approximately 20 minutes. Use caution to avoid electrical wires when applying the solution to prevent corrosion of wire sheathing.

14. Turn all treatment units to bypass mode.

All treatment units, including softeners and cartridge filters, must be bypassed before chlorine is introduced to the distribution system. High chlorine concentrations can damage treatment units, and running chlorine through certain treatment processes can reduce the chlorine's effectiveness downstream. Check the manufacturer specifications for these units; RIDOH recommends you disinfect according to the manufacturer's recommendation.

15. Open faucets to disinfect the distribution system.

Once water has been circulated back to the well for approximately 20 minutes, turn off the power to the pump. Remove the hose and ensure the well cover/cap is properly secured. Turn on power to the pump.

Operate the well pump until the entire distribution/piping system is full of chlorinated water from the well. Make sure that chlorinated water is flushed through the entire system by following the steps below.

- a) Flush the faucets 1 floor at a time. Start with the lowest level and move up to the top floor.
- b) Turn on (open) the farthest tap from the well and let the water run until you detect an odor of chlorine or use chlorine test strips to make sure chlorinated water is present. When you detect chlorine, close the tap. Repeat this at all water faucets (inside and outside) and showerheads, moving backwards from the farthest tap.
- c) In addition to faucets, flush water/ice dispensers, water heaters, and any other appliance that uses water.

Always follow manufacturer guidance when cleaning/flushing individual components connected to building plumbing. This helps ensure proper flushing and limits the chance of damaging components.

16. Leave chlorinated water in well and piping for 48-72 hours.

Allow the chlorinated water to remain in the well and piping system for **48-72 hours**. **Consumers must NOT use water within plumbing during this time.**

17. Flush chlorinated water from distribution.

After chlorinated water has sat in the distribution for **48-72 hours**, pump the well water to waste (discharge water from outdoor faucet using hose to the ground surface AWAY from: well(s), any surface water system, storm water system, septic system, garden, lawns, etc.) until there is no chlorine left in the water.

Next, discharge the small amount of chlorinated water left in the distribution system (water lines, faucets, other fixtures, etc.) down the appropriate drain(s) until there is no chlorine left in the water. Use chlorine test strips or test kit to check for chlorine in the discharge water from the well or distribution system. Consumers must not drink the water from the plumbing fixtures until there is no chlorine left in the water.

Note: Highly chlorinated water can disrupt microbial activity within septic systems and affect waste

decomposition processes. Therefore, the highly chlorinated discharge water from the well should not be discharged into septic systems. If you have questions regarding disposal of chlorinated water into a septic system, contact the Rhode Island Department of Management's (RIDEM) Onsite Wastewater Treatment System Program for more information (dem.ri.gov/septic). Discharging chlorinated water to surface water or a storm water system is not permitted; contact RIDEM's RI Pollutant Discharge Elimination Systems (RIPDES) Program for further information (dem.ri.gov/ripdes).

18. Reconnect treatment units to the distribution system.

Put any bypassed treatment units back into normal operation. For cartridge filters, replace the old filter with a new filter. Some types of water treatment devices may need to be disinfected or replaced; check with the manufacturer for details.



ENHANCED WELL DISINFECTION TABLE A
5.25% Sodium Hypochlorite Bleach

		Ounces of 5.25% Sodium Hypochlorite Bleach Needed to Achieve 100 ppm Free Chlorine												
		Diameter of Well (in)												
		4	6	8	10	12	16	20	24	28	32	36	42	48
Well Depth (ft)	5	1	2	3	5	7	13	20	29	39	51	67	88	115
	10	2	4	6	10	14	25	40	57	78	102	131	175	229
	15	2	5	10	15	21	38	60	86	117	153	201	263	344
	20	3	7	13	20	29	51	80	115					
	30	5	11	19	30	43	76	119	172					
	40	6	14	25	40	57	102	159	229					
	60	10	21	38	60	86	153							
	80	13	29	51	80	115	204							
	100	16	36	64	99	143	255							
	150	24	54	95	149	215	382							
	200	32	72	127	199	286	509							

Conversion
 1 gal = 128 ounces
 1 quart = 32 ounces
 1 cup = 8 ounces

For a deeper well, sum the ounces as appropriate (e.g. for a 20" diameter, 60' deep well, 119 ounces + 119 ounces = 238 ounces)



ENHANCED WELL DISINFECTION TABLE B
8.25% Sodium Hypochlorite Bleach

		Ounces of 8.25% Sodium Hypochlorite Bleach Needed to Achieve 100 ppm Free Chlorine													
		Diameter of Well (in)													
		4	6	8	10	12	16	20	24	28	32	26	42	48	
Well Depth (ft)	5	1	1	2	3	5	8	13	18	25	32	21	56	73	
	10	1	2	4	6	9	16	25	36	50	65	43	112	146	
	15	2	3	6	9	14	24	38	55	74	97	64	167	219	
	20	2	5	8	13	18	32	51	73						
	30	3	7	12	19	27	49	76	109						
	40	4	9	16	25	36	65	101	146						
	60	6	14	24	38	55	97								
	80	8	18	32	51	73	130								
	100	10	23	41	63	91	162								
	150	15	34	61	95	137	243								
	200	20	46	81	127	182	324								

Conversion
 1 gal = 128 ounces
 1 quart = 32 ounces
 1 cup = 8 ounces

For a deeper well, sum the ounces as appropriate (e.g. for a 20" diameter, 60' deep well, 76 ounces + 76 ounces = 152 ounces)



ENHANCED WELL DISINFECTION TABLE C

12% Sodium Hypochlorite Bleach

		Ounces of 12% Sodium Hypochlorite Bleach Needed to Achieve 100 ppm Free Chlorine													
		Diameter of Well (in)													
		4	6	8	10	12	16	20	24	28	32	36	42	48	
Well Depth (ft)	5	0.3	1	1	2	3	6	9	13	17	22	29	38	50	
	10	1	2	3	4	6	11	17	25	34	45	59	77	100	
	15	1	2	4	7	9	17	26	38	51	67	87	115	150	
	20	1	3	6	9	13	22	35	50						
	30	2	5	8	13	19	33	52	75						
	40	3	6	11	17	25	45	70	100						
	60	4	9	17	26	38	67								
	80	6	13	22	35	50	89								
	100	7	16	28	44	63	111								
	150	10	23	42	65	94	167								
	200	14	31	56	87	125	223								

Conversion
 1 gal = 128 ounces
 1 quart = 32 ounces
 1 cup = 8 ounces

For a deeper well, sum the ounces as appropriate (e.g. for a 20" diameter, 60' deep well, 52 ounces + 52 ounces = 104 ounces)