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Safe water for anyone, anywhere, anytime

Technical Brief

Securing Safe Water in Disaster Recovery *for Small and Medium Sized Water Systems*

Testing water quality at the source, during transportation and at the point of use helps ensure safety.

Water safety begins at the point of production. Water providers verify disinfection through chlorine residual and E. coli monitoring.

Water safety during transport requires hygienic control of delivery vehicles and tanks. Washing and sanitizing reduces secondary contamination verified through testing.

Education on safe water storage and hygienic practices in the home helps to reduce waterborne disease transmission. Keeping containers clean and hand washing are simple but effective measures.

Water District Emergency Response

After flooding or disaster strikes, Water Districts implement their emergency response plans. This includes ensuring safety of plant personnel, communications to media and the public, assessing the impact of the event on critical infrastructure, identifying alternative water sources, replacing equipment and chemical supplies, and **water sampling and monitoring.**

Communications and Public Notification

Water Districts must communicate with critical users and the public on the safety of the water delivered to them. This may include notices to boil water on in more restrictive cases, to Do Not Use. Specific instructions on proper procedures for point-of-use disinfection should be provided. Water District emergency response plans should identify internal and external methods and points of communications and designate staff for this specific task.

Emergency Disinfection – Wells, Storage Tanks, Distribution

During disasters, critical water infrastructure may become flooded and contaminated with sewage or other pollutants. Operators first assess the damage, remove mud and debris that may have entered the system, and then begin the procedures for emergency decontamination and disinfection.

- **Wells:** determine the volume of water in the well (total depth of well – static water level times the diameter). In cases of acute contamination, add enough chlorine (in liquid bleach form) to achieve a concentration of between 5-20 mg/l depending upon the degree of contamination suspected. After 24 hours, pump the well until chlorine is no longer detected. Sample for *E. coli* bacteria.
- **Pressure or hydro pneumatic tanks.** These must be disinfected if it is suspected they have been contaminated. Drain and flush tanks, fill with water containing between 5 - 10 mg/l chlorine, let stand for a minimum of 6 hours (24 is preferred) and drain. Then refill and sample for *E. coli* bacteria.
- **Storage Tank and Distribution System.** Draw down the water in the storage tank, add and mix in the desired amount of chlorine. Draw chlorinated water into the distribution system using blowoff, hydrant or outside faucet. Repeat in each section of the distribution system. Flush with clean water after 24 hours and monitor for *E. coli* bacteria.

Other water system equipment including intakes and treatment plant equipment must be assessed for function and properly cleaned prior to being placed back into service. Use *E. coli* test kits to isolate sources of contamination and perform follow up monitoring to ensure water is potable. Results must indicate an absence of *E. coli* bacteria prior to determining that the water is potable.

The Aquagenx Compartment Bag Test (CBT) is a portable water quality test kit that lets anyone, anywhere determine if drinking water contains E. coli bacteria and poses a health risk. No electricity, cold chain, laboratories or trained technicians are needed to use the CBT. Water quality testing and monitoring are done in simple steps with easy-to-score, visual, color change results. For more info, email at info@aquagenx.com

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Use these tables to help determine the proper amount of chlorine to effectively disinfect water system components. *Reference: Washington State Department of Health, Division of Environmental health, office of Drinking Water.*

Table 1. Well Volume (well depth – static water level)

Calculating Well Volume	
Well Casing Diameter (inches)	Volume (gallons per vertical foot of water)
6”	1.5
8”	2.6
10”	4.1
12”	5.9
14”	8
16”	10
36”	53

Table 2. Well Disinfection

Well Disinfection – Amount of Chlorine Bleach to Use				
Well Volume (gallons)	Desired Chlorine Dosage			
	Household Bleach (6%)			12%
	2 mg/l	5 mg/l	20 mg/l	5 mg/l
50	½ Tbsp*	1 ¼ Tbsp	4 ½ Tbsp	½ Tbsp
100	1 Tbsp	2 ¼ Tbsp	9 Tbsp	1 Tbsp
200	2 Tbsp	5 Tbsp	1 ¼ cups**	2 Tbsp
500	4 ½ Tbsp	¾ cups	2 ¾ cups	5 Tbsp
1000	9 Tbsp	1 ½ cups	5 ½ cups	¾ cups

*1 Tbsp = 15 ml, or 0.5 fluid ounces ** 1 cup = 225 ml, or 8 ounces

Table 3. Reservoir Disinfection

Reservoir Disinfection – Amount of Chlorine Bleach to Use				
Reservoir Volume (gallons)	Desired Chlorine Dosage			
	Household Bleach (6%)			12%
	2 mg/l	5 mg/l	20 mg/l	5 mg/l
5,000	1 ½ cups	6 2/3 cups	13 1/3 cups	1 cup
10,000	2 2/3 cups	13 ½ cups	1 ¾ gallons	1 ¼ cups
20,000	5 ½ cups	1 ¾ gallons	3 ½ gallons	3 cups
50,000	13 ½ cups	4 ¼ gallons	8 ½ gallons	7 cups
100,000	1 ¾ gallons	8 ½ gallons	16 ¾ gallons	¾ gallon

Table 4. Distribution System Disinfection

Estimating Volume of Water in the Distribution System		
Pipe Diameter (inches)	Volume (gallons per linear foot of pipe)	Volume (gallons per 100 feet of pipe)
1	0.04	4
2	0.16	16
4	0.65	65
6	1.47	147