

Emergency Chlorination Plan

Waterworks

Contacts & Phone Numbers

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Purpose

Introduction

Emergency chlorination is a detailed action that a waterworks takes to chemically treat a bacteriological contamination event or an event that may have introduced bacteriological contaminants. This plan provides the steps necessary for the waterworks operator to increase chlorination to the point at which a free chlorine level of 0.5 mg/l is reached throughout the distribution system within four (4) hours of identifying a bacteriological threat.

These plans should be updated as the water system, staff, and equipment change. The Plan should be practiced.

When to use

The following situations require emergency chlorination:

Bacteriological event.

Pressure loss of more than 25% of the system, the WDNR is to be notified immediately. The WDNR will require emergency chlorination, a boil water advisory and additional sampling.

Any time a waterworks determines that there is a perceived or imminent biological contamination event. The waterworks will begin emergency chlorination if it has some knowledge that system integrity has been jeopardized.

Emergency Chlorination Procedure

Objective: Get 0.5 mg/l of free chlorine throughout the distribution system within 4 hours of being notified of a total coliform positive bacteria sample result.

Procedure must include:

- **Target dose**
- **Source water dosing at wells or entry points**
- **Reservoir/Storage dosing**
- **Flushing Testing & Adjustment**

1. **Target Dose** (target dose must never exceed 4 mg/l without prior approval or prior experience)

Determine the existing free chlorine level in the distribution system and at the entry points. The following locations shall be tested first:

- a. Well(s)
- b. Tower or reservoir
- c. Distribution System

Determine how much additional chlorine is needed in the system based on the results to get system to 0.5 mg/l free chlorine. See Chemical Worksheets to calculate adjustments. Track amount of chemical used and feed rates.

2. Reservoir or Storage Vessel Dosing

Complete calculation work sheet for shock chlorinating each reservoir in the system. If the contamination seems to be localized consider using a higher dose in the reservoir that serves that area.

Plan should discuss access to reservoir (where are keys kept) and necessary safety equipment needed to gain access.

3. Flushing Testing & Adjustment

Flush water from the following hydrants to draw chlorine out into the distribution system:

- a. hydrant List as needed for proper flushing of system. A system map should be kept with this section plan.

Obtain follow-up bacti samples as directed by the WDNR; be sure to test free chlorine concentration at each sample location. Continue emergency chlorination until all follow-up samples come back safe and the WDNR lifts the requirement.

Equipment Specifications Summary

Water System Information

WELLS	Well	Well
Pumping Capacity (gpm)		

STORAGE RESERVOIR(S)	Tower
Type (clearwell/ground/elevated)	Elevated or other
Capacity (gal)	

*Note the functional capacity based on float settings or other controls (Add as needed)

Chlorination System Information

FEED EQUIPMENT	LOCATIONS	
Chlorine, Feed Pump, Lines, Injector, Solution Container	Well	Well
Pump Make/Model		
Max Design Injection Rate	gpd	gpd
Solution Container Volume	gallons	gallons

Supplier	
Contact Information	
Type or Name of Chlorine	
Percent Strength on Label (%)	
Density (lbs/gal)	

Chemical Calculation Worksheet

CHLORINE FEED SYSTEM	
Pump Make/Model	
Max Design Injection Rate (gpd)	
Solution Container Volume (gallons)	

Parameter	Units	Symbol	Value
Density of Chlorine Solution (on MSDS)	lb/gal	D	
Liquid Chlorine Concentration (on factory label)	%	C	
Target Chlorine Concentration	mg/l	T	
Maximum Feed Rate of Chlorine Pump (on pump housing) Use at 100% less for reduced settings	Gpd	F	
Well Pump Capacity in Millions of Gallons per Day (_____ gpm x 60 minutes x 24 hours/1000000)	Mgpd	W	

Chlorine Dose Calculation

- Formula to find the dose that will result when chemical feeder is maxed out

$$T = \frac{D \times F \times C}{W \times 8.34}$$

- If the dose is too high, slowly reduce the speed, keeping the stroke setting.

Reservoir Chemical Calculation Worksheet

Find

- Chlorine dose per gallon of chlorine dumped into the tower

Given

Parameter	Units	Symbol	Value
Density of Chlorine Solution (on MSDS)	lb/gal	D	
Liquid Chlorine Concentration (on factory label)	%	C	
Target Chlorine Concentration	mg/l	T	

Reservoir Storage Volume (in millions of gallons)	MG	R	
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Reservoir Chlorination Calculation

- Formula to show the resulting increase in chlorine level per gallon of chlorine dumped into a reservoir

$$\boxed{T} = \boxed{D \times C} / \boxed{R \times 8.34}$$

Example: Calculation for Sodium Hypochlorite with 500 gpm well

Dosage concentration (D) = (F) (C) ÷ (W) (8.34)

F = Maximum chlorine pump feed rate, expressed as pounds/day

C = Chlorine concentration, expressed as a percentage (%)

W = Well pump capacity, expressed as million gallons/day (MGD)

8.34

= weight (in pounds) of one gallon of water

F = (10 gallons/day) (10 pounds/gallon) = 100 pounds/day

C = 12.5 %, convert to a decimal = 0.125

W = (500 gallons/minute)(60 minutes/hour)(24 hours/day) = 720,000 gallons = .72 MGD

D = (100)(.125) ÷ (.720)(8.34) = 2.08 mg/l

(Dosage for post chlorination pump set at maximum speed).