

DISCLAIMER: This document summarizes basic operational, maintenance and monitoring guidelines for chlorination systems serving small public water systems. The guidelines are directed toward chlorination of groundwater sources not subject to significant bacteriological contamination. Nothing in this document supersedes any statutory or regulatory requirements or permit provisions for public water systems. The information below is provided for general information only.

Operation of Continuous Chlorination System

- Operator Certification/Personnel – All persons responsible for the operation of the chlorination system must be reliable, trained and possess a State water operator's certificate of appropriate grade and type (Treatment and/or Distribution Operator). More than one operator should be assigned the responsibility of knowing the routine and emergency chlorination procedures.
- Targeted free chlorine residual – The targeted free chlorine residual range for most systems should be 0.2 mg/L to 1.0 mg/L within the distribution system. At no time should the level be over 4.0 mg/L at the first service connection after the chlorination system.
- Storage of chlorine solution – To minimize the decomposition of chlorine and the formation of chlorate and perchlorate, the following operational practices should be considered:
 - The chlorine solution should be stored in a cool, dry, well-ventilated area, away from direct sunlight and heat.
 - Dilute the stored chlorine solution to eight percent strength or less. Lower chlorine solution strength should be evaluated based on chemical pump performance, feed rate and desired chlorine residual.
 - Minimize storage time for both unopened containers and diluted solutions. Water systems should maintain approximately 30 days of chlorine supply onsite and cycle through diluted solutions at least once per month.
 - Avoid exposure of the chlorine solution to metal materials that might contain iron, copper, nickel and cobalt.
 - All chemicals or products, including chlorine, added directly to the drinking water as part of a treatment process must meet ANSI/NSF Standard 60.
- Inspecting and adjusting the equipment – Equipment should be inspected often enough to ensure prompt detection of problems. Daily inspection of the equipment is recommended. The required frequency of inspecting the equipment is set on a case-by-case basis depending on the system configuration, the consequences of an undetected failure and historical system reliability.

The inspection should consist of a visual inspection of the equipment, checking and filling the chlorine solution level, measuring the free chlorine residual, adjusting the equipment, calculating the dosage rate and writing down the results of the inspection. Any problems noted must be corrected.

- Responding to failures or interruptions – Each system should have a written procedure for responding to chlorination failures or interruptions. This procedure should include prompt repair or correction of the problem and restoration of the chlorine residual. The availability of a replacement or back-up chemical feed system should be addressed.
- Operation and inspection records – Operation and inspection records should be kept each day and should include the following as a minimum. The attached forms may be used to maintain records.
 - Date and time of inspection, name of operator.
 - Chlorine residual and location of residual measurements using the DPD method.
 - Production records.
 - Operational notes.
 - Chlorination failure log.
 - Maintenance performed (both preventative and unscheduled maintenance).

Maintenance of Continuous Chlorination Systems

- Chlorine solution tank – The chlorine solution tank should be emptied and cleaned at least once per year. More frequent cleaning may be necessary depending upon the source water used to prepare the diluted chlorine solution.
- Chlorine feed pump – Preventative maintenance of the chlorine feed pump, such as diaphragm or peristaltic pumps, should be performed in accordance with the manufacturer's specifications. All suction and discharge lines; foot valve and screen; injection valve; pump suction and discharge valves, seats and springs; and pump diaphragm should be replaced annually. Sufficient repair kits, spare parts and equipment for routine maintenance and repair should be kept on hand.
- Descaling – Injectors, diffusers and other components that come into contact with the chlorine solution should be descaled periodically by flushing with a weak acid solution.



Monitoring of Continuous Chlorination Systems

- Monitoring free chlorine residual - Free chlorine residual should be measured using the DPD method and recorded on a regular basis. Prior to sample analyses, the water system should verify that the sample vials are not stained or scratched and reagents are not expired. A pool test kit is **not** acceptable. Free chlorine residual should be measured before and/or after storage (if applicable), prior to the first service connection, and throughout the distribution system at sample sites that are representative of water served to the system. The required frequency of chlorine residual monitoring is set on a case-by-case basis depending on the system configuration. Daily measurement of the residual is recommended.



- Collecting a bacteriological sample – Whenever a bacteriological sample is collected for compliance, a chlorine residual must also be taken at the same time and location. The chlorine residual reading must be recorded on the chain of custody paperwork that comes with the water sample kit.
- Reporting – Operational records and chlorine residual results should be kept onsite for a minimum of three years and may be reviewed and/or submitted to the Division of Drinking Water upon request.

Response to Failures and Interruptions for Chlorination Systems

System Name _____ System Number: _____

In the event the chlorination system is found to be not operating or injecting too little chlorine solution, the following plan of action will be taken to correct the problem or situation. The plan should address the availability of a spare chlorinator, manual feeding of chlorine until the problem is resolved, more frequent chlorine residual monitoring, etc.:

Short-term chlorinator interruption (i.e. less than one day):

Longer-term chlorine interruption (i.e. chlorinator cannot be repaired):

Prepared by: _____ Date: _____

Notes: This plan to be posted at the chlorination station.
This plan to be reviewed and updated annually

State Water Resources Control Board
Division of Drinking Water

Chlorination Operational Log

Month _____ Year _____

System Name _____ Number _____

Were there any malfunctions of the chlorination system this month? Yes _____ No _____

If yes, list the date the malfunction occurred and action taken. Problems that cannot be promptly corrected must be reported to the Division. Bacteriological sampling must be conducted if the safety of the water is in question:

Date	Time	Operator Initials	Free Chlorine Residual	Production Meter Reading	Gallons of Water Produced	Gallons of Chlorine Solution Used	Chlorine Dosage (mg/L)	Operational Notes
1								
2								
3								
4								
5								
6								
7								
8								
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This form should be kept on file for review by the Division.