DEPARTMENT OF HEALTH AND HOSPITALS
Public Health

Chloramination Recommendations For Public Water Systems that Chloraminate

PURPOSE: The Ten State Standards interim standard on chloramination states: *"Operating authorities who wish to modify disinfectant practices by using chloramine must show the reviewing authority clear evidence that bacteriological and chemical protection of consumers will not be compromised in any way …"*

I. Recommendations for Systems that Chloraminate.

Monochloramine and free ammonia levels should be tested periodically to ensure that the targets of chloramination are being met. The current ammonia level in the source water of both surface and groundwater systems will affect the amount of chlorine and ammonia required to achieve the desired chlorine to ammonia ratio. Inadequate ammonia feed rates can result in taste and odor problems within the distribution system, while higher free ammonia levels within the distribution system can result in creating nitrite levels high enough to exceed the maximum contaminant level, placing small infants at risk.

A. The plant should develop and submit to the District Office for review and approval an operational plan specific to chloramination. At a minimum, the plan needs to address the following items:

1. The water system's targets with respect to chloramination including, but not limited to, the following:

   a) The facility's target chlorine to ammonia ratio needs to be established. To avoid breakpoint reactions, utilities generally strive to maintain the Cl_2:NH_3 ratio in the range of 2.5:1 to 4.1:1 (NH_3 as ammonia) or 4.5:1 to 5:1 (NH_3 as nitrogen)[1].

   b) A free ammonia level (NH_3-N) target of 0.01 – 0.04 mg/L, measured at the entrance to the distribution system, is recommended[1].

   c) A chloramine residual target of 2.0 – 3.0 mg/L at the entry point to the distribution system, and greater than 1.5 mg/L in the distribution system to prevent nitrification, is recommended[1]. Once nitrification is established, these levels may not be inhibitory and a free chlorine burn may be necessary.

2. Step by step procedures to effectively operate the treatment plant with respect to chloramination. The procedures should include daily, weekly, etc. task performed by the operator such as the need for chemical adjustment, monitoring and the review of data to ensure that targets are being met.

[1] AWWA M56 Fundamentals and Control of Nitrification in Chloraminated Drinking Water Distribution Systems.

B. The plant should use test kit(s) or laboratory procedure(s) that are approved or acceptable by EPA/DHH that can measure the following:

1. Free Ammonia - the remaining ammonia concentration that has not reacted with chlorine in the treatment process to form monochloramine; preferably the analytical method used can differentiate between inorganic ammonia and naturally-occurring organic nitrogen compounds, such as urea, that might be present in surface water. Standard Methods include ASE 4500-NH_3 D or 4500-NH_3 E.

2. Chloramine (measured as Total Chlorine) - Total chlorine includes all species of chloramines (mono-, di-, tri- and organo) and free chlorine. The chloramine residual can be determined by various standard methods. Standards Methods include the Amperometric Titration (SM 4500-Cl D and E), *N*,*N*-diethyl-*p*-phenylenediamine (DPD) Ferrous Titrimetric (SM 4500-Cl F), DPD Colorimetric (SM 4500-Cl G) and Iodometric Electrode (SM 4500-Cl I).

3. Monochloramine - with the ability to distinguish between monochloramine levels and other forms of total chlorine.

C. The water system should measure, record and take corrective action per the following:

1. Free ammonia and monochloramine should be monitored at least weekly at the entry point to the distribution system. More frequent monitoring is recommended in the event that the target free ammonia level, identified in the water systems chloramination operational plan, is exceeded. As a guideline, a target free ammonia level at the entrance to the distribution system of 0.10 mg/L is recommended.

2. The water system should develop and implement a nitrification monitoring program. Suggested monitoring parameters include chloramine residual, free ammonia, heterotrophic bacteria plate count (HPC) and nitrate/nitrite. Recommended monitoring locations include a representative number of locations (*i.e.*, TCR bacteriological sample site(s), tanks, dead-end mains) selected from within the distribution system. Monitoring frequencies should coincide with the collection of routine monthly bacteriological sample(s), although less frequent monitoring may be considered appropriate.

3. Chloramination process control samples should be monitored prior to and after adjusting chlorine and/or ammonia feed rates. Process samples are generally collected from taps located upstream and downstream from where each chemical is being added. Sample collection points used for process control monitoring shall be identified in the water system's sampling plan.

II. Other General Guidelines.

A. All monitoring data should be recorded on approved forms (see attachments below).

B. Records of monochloramine, total chlorine and free ammonia monitoring must be maintained with the system's disinfectant records for a period of 10 years in accordance with 40 CFR 141.33, and made available to the OPH staff upon request.

C. Be reminded that for surface water systems that chloraminate, water delivered to the distribution system shall contain a disinfectant residual of not less than 0.4 mg/l total chlorine for more than four hours in any 24 hour period.

D. Any change in the type of disinfectant used (*i.e.*, free chlorine to chloramines, or chloramines to free chlorine) will require approval from the DHH. In addition, public notification is mandatory for systems converting to chloramines. Systems should contact their District or Regional Office for specific requirements related to plans submittal and public notification.

E. Monitoring outlined above is in addition to disinfection monitoring requirements found in LAC 51:XII.1125 for surface water system, and should not be construed as alleviating the water system from LAC 51:XII.1125 requirements.

ATTACHMENTS:

- Chloramination Report Forms:
  - ATT 12.2.6-1: Chloramination Point of Entry Report Form
  - ATT 12.2.6-2: Chloramination Process Control Sample Report Form
  - ATT 12.2.6-3: Chloramination Additional Triggered Monitoring Report Form
  - ATT 12.2.6-4: Chloramination Distribution System Point of Collection Report Form