

DATE: October 8, 1996

TO: Office of Water Programs Staff

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SUBJECT: Water – Procedure – Surveillance –
Monitoring of Additives to Drinking Water

Purpose:

Monitoring of all chemicals added to drinking water is necessary to assure that the primary chemical additive and associated impurities are limited to amounts necessary to achieve an approved treatment objective and remain below established acceptable levels in drinking water.

BACKGROUND

The *Waterworks Regulations* (12 VAC 5-590-860) requires only chemicals authorized in the construction permit or subsequently authorized by the Division and in compliance with the National Sanitation Foundation (NSF) Standard 60 shall be added to drinking water.

The *Waterworks Regulations* (12 VAC 5-590-950 I.) requires that laboratory equipment be provided for determining the effectiveness of stabilization treatment and concentration of chemicals in the treatment and concentration of chemicals in the treated water. Also, Appendix G requires that each chemical addition process should be monitored to determine the effectiveness of stabilization treatment and concentration of chemicals in the treated water. The type, frequency, and location of tests shall be set by the Division on an individual basis.

Federal EPA regulations and the *Waterworks Regulations* establish Primary and Secondary Maximum Contaminant Levels for chemicals which are maximum allowable levels for the regulated chemicals in drinking water from all sources. In addition, NSF establishes a maximum

allowable level for each treatment chemical or chemical additive certified under NSF Standard 60. The NSF Maximum Dose is defined as the maximum concentration of a direct additive that has been found to be acceptable under the NSF Standard 60. Chemical additives must not exceed the Maximum Allowable Level (MAL) of any contaminant in the product at the Maximum Dose. The MAL is the maximum concentration of a contaminant in drinking water that a single product is allowed to contribute under this standard. The MAL shall not exceed 10 percent of the EPA established MCL for drinking water or 10 percent of a calculated Maximum Drinking Water Level for unregulated contaminants except that chemicals required by regulatory authorities may be added up to the regulatory limit¹ (e.g. fluoride).

GUIDANCE

Measures must be implemented to assure that addition of any chemical to drinking water does not exceed the above allowable requirements unless the Department specifically approves an alternate allowable level. Such measures must include:

- 1) use of accurate metering feed equipment,
- 2) electrical interlock where pumping and chemical addition are to occur simultaneously,
- 3) flow pacing where the water flow rate is not constant,
- 4) chemical inventory accounting
- 5) routine calibration of feed equipment including use of calibration chambers for liquid feeders and weight scales for dry chemicals and/or direct measurement of feed chemical,
- 6) auxiliary devices to minimize the potential for an overfeed, and
- 7) routine monitoring of the chemical concentration or an acceptable surrogate in the treated water.

Chemicals for which there is an MCL for the primary chemical components or for which a hazardous condition could otherwise result from an overfeed should include additional precautions on the feed system such as an integrated flow which prevents operation of the feeder when water flow is interrupted.

The table on the following page lists the most frequently used water treatment chemicals along with the current Maximum Dose (maximum use) under NSF Standard 60 and recommended monitoring parameters or indicators, in addition to feed rate. The NSF Standard 60 maximum dose in the table should be used only as a preliminary guide. The most current NSF Standard 60 maximum dose in the table should be used only as a preliminary guide. the most current NSF listing should be consulted for up to date limits on specific chemicals from specific manufacturers.

When a chemical is added at a level of 20% or less of the NSF Maximum Dose test monitoring may be waived if good feed rate control is provided. This waiver does not apply to MCLs contained in the *Waterworks Regulations* or EPA SDWA Regulations. The frequency of testing will usually be governed by treatment process monitoring or other requirements in the *Waterworks Regulations*. Testing frequency for the sole purpose of assuring that NSF maximum dosages are not exceeded should be a minimum of daily for Waterworks ≥ 1.0 MGD, 3 per week for Surface Water Treatment Plants < 1.0 MGD and 1 per week for small groundwater waterworks.

Chemical	Maximum Dose (Maximum Use) Listed Under NSF 60	Monitoring Parameters
Aluminum Sulfate (Alum) Coagulant	150 mg/L ²	Floc formation, Zeta Potential, Streaming Current
Ferric Chloride Coagulant	250 mg/L	Floc formation, Zeta Potential, Streaming Current
Calcium Hydroxide (Lime – Hydrated)	650 mg/L	pH, Calcium Hardness, alkalinity
Sodium Hydroxide – (Caustic Soda), Liquid 50%	100 mg/L	pH, alkalinity, CO ₂ in some cases
Sodium Bicarbonate	100 mg/L	pH, alkalinity
Chlorine (gas)	30 mg/L	Chlorine Residual (Free or Total)
Sodium Hypochlorite	Varies from 100 mg/L to 350 mg/l based on Mfg.	Chlorine Residual (Free or Total)
Calcium Hypochlorite – HTH	46 mg/L – May vary based on Mfg.	Chlorine Residual (Free or Total)
Fluorosilicic Acid	6 mg/L	Fluoride
Sodium Fluoride	2.3 mg/L	Fluoride
Sodium Fluorosilicate	8 mg/L	Fluoride
Potassium Permanganate	50 mg/L	Apparent visible color or manganese
Polymers – coagulant and filter Aids	varies based on produce and Mfg	Case by case – consider Mfg. recommendation
Orthophosphates and Blended Orthophosphates	varies based on product and Mfg.	orthophosphate
Hexametaphosphate and Polyphosphate blends w/o Orthophosphate	varies based on product and Mfg.	total phosphate ³
Silicates and Silicate blends	varies based on product and Mfg.	silicate, if adequate sensitivity between raw and treated water can be obtained

Note: See Table 3-2 of the EPA Lead and Copper rule Guidance Manual, Volume 2 – Corrosion Control Treatment, September 19, 1992 for additional information.