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An Office of the Department of Health and Human Services
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Surface Water Treatment Rule Policies

Note: Where the "Guidance Manual" is referenced, please refer to the following document: Guidance Manual for Compliance with the Filtration and Disinfection Requirements for Public Water Systems Using Surface Water Sources ©1990. U.S. EPA contract number 68-01-6989, March 1991 Edition.

The term "surface water" refers also to groundwater systems which have been determined to be groundwater under the direct influence of surface water (GUI).

Systems with Continuous Turbidity Monitors (see Guidance Manual, p. 4-10, 4.3.2)
Public Water Systems which use continuous turbidity monitors must read turbidity from a point indicative of common filtered water effluent at equal 4 hour intervals for minimum compliance with the Surface Water Treatment Rule. One sample every four hours is the minimum required under the existing Surface Water Treatment Rule for combined filter effluent, while individual filter effluent turbidity should be monitored continuously (every 15 minutes, minimum). Only conventional and direct filtration systems with more than two filter beds are required to continuously monitor individual filter effluent turbidity.

Frequency of Turbidity Sampling
Systems may collect more turbidity samples than are required during the course of a day for reporting purposes. For example, turbidity could be collected every hour for a total of 24 samples throughout the day. The 95th percentile is based on the total number of samples collected throughout the month. For example, a water system reads the turbidimeter at equal 1 hour intervals every day for a total of 24 separate turbidity readings. Over the course of a 30 day month, the total number of samples reported for compliance is 720. To meet the 95th percentile requirement, 684 of the 720 samples would need to be equal to the turbidity limit for that system.

Turbidity Spikes
The Drinking Water Program strongly recommends evaluating the cause of turbidity spikes through the use of turbidity analysis and particle counting.

Individual Filter Monitoring
The Drinking Water Program requires individual filter monitoring on a continuous basis. The Interim Enhanced Surface Water Treatment Rule requires surface water systems using direct or conventional filtration serving populations greater than 10,000 to monitor each filter's turbidity on a continuous, individual basis. In addition, the Long Term1 Enhanced Surface Water Treatment Rule requires surface water systems using direct or conventional filtration serving populations less than 10,000 to monitor each filter's turbidity on a continuous, individual basis as of January 1, 2005.

Filter to Waste
The Drinking Water Program strongly recommends that filters employ filter to waste lines to allow operators to eliminate turbidity spikes.

Location of Common Effluent Turbidimeter
Common effluent turbidimeters should be located after filtration at a point prior to chemical addition (e.g. fluoride, corrosion control chemicals that could increase turbidity).

Maximum Turbidity Levels
Turbidity levels referenced in the Surface Water Treatment Rule are modified as follows:

- 0.3 NTU is interpreted as 0.349 NTU (direct filtration, conventional filtration)
- 1 NTU is interpreted as 1.49 NTU (slow sand, alternative filtration technologies)
- 1.5 NTU is interpreted as 1.549 NTU (systems w/ an avoidance to filtration)
- 5 NTU is interpreted as 5.49 NTU (systems w/ an avoidance to filtration)

Contact Time Guidelines
"Contact Time" (CT) is the product of disinfectant residual and the amount of time the residual is in contact with drinking water at or before the first customer. For example, at 0.5 mg/l free chlorine and 20 minutes of time, the product is 10 mg min/l, or ten minutes of Contact Time.

Disinfectant Contact TIME ("T" in CT calculations): The time in minutes that it takes for water to move from the point of disinfectant application or the previous point of disinfectant residual measurement to a point before or at the point where residual disinfectant concentration (C) is measured. Where only one C is measured, T is the time in minutes that it takes for water to move from the point of disinfectant application to a point before or at where residual disinfectant concentration (C) is measured. Where more than one C is measured, T is (a) for the first measurement of C, the time in minutes that it takes for water to move from the first or only point of disinfectant application to a point before or at the point where the first C is measured and (b) for subsequent measurements of C, the time in minutes that it takes for water to move from the previous C measurement point to the C measurement point for which the particular T is being calculated. Disinfectant contact time in pipelines must be calculated based on plug flow by dividing the internal volume of the pipe by the maximum hourly flow rate through that pipe. Disinfectant contact time within mixing basins and storage reservoirs must be determined by tracer studies or an equivalent demonstration.

Contact time is not well defined for filtered water systems, with inactivation discretion explicitly given to the State by the Surface Water Treatment Rule. 40 CFR 141.72 (b) (1) states that:

> "The disinfection treatment must be sufficient to ensure that the total treatment processes of that system achieve at least 99.9% (3-log) inactivation and/or removal of Giardia lamblia cysts and at least 99.99% (4-log) inactivation and/or removal of viruses as determined by the State."

The next section of the Surface Water Treatment Rule permits chlorine residuals entering the distribution system as low as 0.2 mg/l. Because it is not cost effective to construct filtration plants that can meet CT requirements at 0.2 mg/l, the Drinking Water Program's policy on disinfection contact time for filtered water systems is listed in the following two options.

1. Design the water treatment system to achieve the required log removal at 0.2 milligrams per liter disinfectant entering the distribution system at low temperature, high pH, and peak flow conditions. Daily proof of contact time computations would not be required if this option is chosen.

2. Design the water treatment system to meet the required log removal at greater than 0.2 milligrams per liter disinfectant entering the distribution system. The water system will be required to perform daily contact time computations to demonstrate compliance with the minimum inactivation requirement. The Drinking Water Program recommends designing contact time systems for:
   - ✓ peak hourly flow
   - ✓ lowest observed temperature during operating season
   - ✓ highest observed pH during operating season
   - ✓ conservative baffling factor estimates for contact chamber (baffling estimates should be confirmed with a tracer study)
   - ✓ low contact tank level
   - ✓ free chlorine residual of 0.5 to 1.0 milligram per liter entering the distribution system.

"Peak hourly flow" does not mean the absolute peak flow at any instant, but the highest pumpage hour during the day. The time T used in calculating CT, then, is the time it takes the water, during peak hourly flow, to move between the point of disinfection application and the point at which the residual is measured." *(from Surface Water Treatment: The New Rules, by Harry Von Huben, © 1991, AWWA, ISBN 0-89867-536-7)*

The *Giardia lamblia* removal credits rewarded for each type of filtration technology are included in the table at the end of this document. Water systems shall use the disinfection contact times in Appendix E of the Guidance Manual for compliance with CT requirements.

Consistent with contact time requirements for unfiltered public water systems defined in 40 CFR 141.72 (a) (1), contact time must be achieved every day the water system serves water to the public, except any one day each month.
Redundant disinfection facilities (e.g. twin chemical feed pumps, chlorine gas delivery systems, parallel ozone trains, etc.) are strongly recommended.

40 CFR 141.74 (c) states that continuous disinfectant analyzers are **required** for Public Water Systems which are regulated under the Surface Water Treatment Rule and are larger than 3,300 population. Continuous disinfectant analyzers are strongly

recommended for systems under 3,300 population. Continuous disinfectant analyzers should be connected to pump or flow controls and an alarm or automatic shutdown system. When disinfectant falls below a pre-determined set point (e.g. minimum disinfectant residual to achieve CT for a given time period), the water system should automatically shut down and the operator should be immediately notified.

Alternative Filtration Technologies
Alternative Filtration Technologies are awarded 1.5 log removal credit. No additional credit shall be awarded by the Drinking Water Program. Technologies which have not been approved by the Drinking Water Program must obtain approval.

Removal Requirements for Surface Water Systems (see 40 CFR 141.72 (a) (1) and (b) (1))
All surface water systems are required to achieve a total of 3.0 log removal and or inactivation of *Giardia lamblia*. No additional removal credits shall be given for source water protection or evidence of increased log removal via filtration.

Removal Credits Granted to Filtration Technologies: (see 40 CFR 141.73 for filtration technologies and how they are defined by the Surface Water Treatment Rule; see also Guidance Manual, pages 5-5 through 5-8)

Technology	Credit Recommended in Guidance Manual (p. 4-25)	Credit Awarded by Drinking Water Program	Disinfection inactivation required
Alternative Filtration Technologies	2.0 log Giardia lamblia removal (same as slow sand)	1.5 log Giardia lamblia removal (based on study by McBurnie)	1.5 log Giardia lamblia inactivation
Conventional Filtration	2.5 log Giardia lamblia removal	2.5 log Giardia lamblia removal	0.5 log Giardia lamblia inactivation
Direct Filtration	2.0 log Giardia lamblia removal	2.0 log Giardia lamblia removal	1.0 log Giardia lamblia inactivation
Slow Sand Filtration	2.0 log Giardia lamblia removal	2.0 log Giardia lamblia removal	1.0 log Giardia lamblia inactivation