567—43.10(455B) Enhanced filtration and disinfection requirements for SW and IGW systems serving fewer than 10,000 people.

43.10(1) *General requirements.*

a. Applicability. This rule constitutes national primary drinking water regulations, and it establishes requirements for filtration and disinfection in addition to the filtration and disinfection requirements in 567—43.5(455B). This rule is applicable beginning January 1, 2005, unless otherwise noted, to all PWSs using SW or IGW, in whole or in part, and that serve less than 10,000 people. This rule establishes or extends TT requirements in lieu of MCLs for the following contaminants: *Giardia lamblia*, viruses, HPC bacteria, *Legionella*, *Cryptosporidium*, and turbidity. The TT requirements consist of installing and properly operating water treatment processes that reliably achieve:

(1) At least 99 percent (2 log) removal of *Cryptosporidium* between a point where the raw water is not subject to recontamination by SW runoff and a point downstream before or at the first customer for filtered systems; and

(2) Compliance with the profiling and benchmark requirements in 43.10(2) and 43.10(3).

b. Prohibition of new construction of uncovered intermediate or finished water storage facilities. Systems required to comply with this rule may construct only covered intermediate or finished water storage facilities. For the purposes of this rule, an intermediate storage facility is defined as a storage facility or reservoir after the clarification treatment process.

43.10(2) *Disinfection profile.*

a. Applicability. A disinfection profile is a graphical representation of a system's level of *Giardia lamblia* or virus inactivation measured during the course of a year. All systems required to comply with this rule must develop a disinfection profile unless the department determines that such a profile is unnecessary. Records must be maintained according to 43.10(7).

(1) The department may approve the use of a more representative data set for disinfection profiling than the data set required in 43.10(2)*"b."*

(2) The department may determine that a disinfection profile is unnecessary only if a system's TTHM and HAA5 levels are below 0.064 mg/L and 0.048 mg/L, respectively. To determine these levels, TTHM and HAA5 samples must be collected during the month with the warmest water temperature and at the point of maximum residence time in the distribution system. The department may approve the use of a more representative annual data set to determine the applicability of this subrule. The annual data set must be calculated on an annual average using the arithmetic average of the quarterly averages of four consecutive quarters of monitoring. At least 25 percent of the samples collected in each quarter must be collected at the maximum residence time location in the distribution system.

(3) If a producing system that provides water to other PWSs meets the byproduct level requirements of less than 0.064 mg/L for TTHM and less than 0.048 mg/L for HAA5, it will not be required to develop a disinfection profile and benchmark unless:

1. The consecutive system cannot meet the byproduct level requirements of less than 0.064 mg/L for TTHM and less than 0.048 mg/L for HAA5 in its distribution system, and

2. The producing system wants to make a significant change to its disinfection practices.

b. Required elements of a disinfection profile.

(1) A system must monitor the following parameters to determine the total log inactivation using the analytical methods in 43.5(4)*"a,"* once per week on the same calendar day, over 12 consecutive months.

1. Temperature of the disinfected water at each RDC sampling point during peak hourly flow, measured in degrees Celsius;

2. For systems using chlorine, the pH of the disinfected water at each RDC sampling point during peak hourly flow, measured in standard pH units;

3. The disinfectant contact time ("T") during peak hourly flow, measured in minutes; and

4. The RDC(s) ("C") of the water following each point of disinfection at a point(s) prior to each subsequent point of disinfection and at the entry point to the distribution system or at a location just prior to the first customer during peak hourly flows, measured in mg/L.

(2) The data collected in 43.10(2)*"b"*(1) must be used to calculate the weekly log inactivation, along with the $CT_{99.9}$ tables in Appendix A. The system must calculate the total inactivation ratio as follows and multiply the value by 3.0 to determine log inactivation of *Giardia lamblia*.

1. If a system uses more than one point of disinfectant application before the first customer, the system must determine the ($CT_{calc}/CT_{99.9}$) value of each disinfection segment immediately prior to the next point of disinfectant application, or for the final segment, before or at the first customer, during peak hourly flow. The system must calculate the total inactivation ratio by determining ($CT_{calc}/CT_{99.9}$) for each sequence and then adding the ($CT_{calc}/CT_{99.9}$) values together to determine $\Sigma(CT_{calc}/CT_{99.9})$.

2. If the system uses only one point of disinfectant application, it must determine:

- One inactivation ratio ($CT_{calc}/CT_{99.9}$) before or at the first customer during peak hourly flow, or
- Successive ($CT_{calc}/CT_{99.9}$) values, representing sequential inactivation ratios, between the point of disinfection application and a point before or at the first customer during peak hourly flow. The total inactivation ratio must be calculated from the successive values by determining ($CT_{calc}/CT_{99.9}$) for each sequence and then adding the ($CT_{calc}/CT_{99.9}$) values together to determine $\Sigma(CT_{calc}/CT_{99.9})$.

3. If a system uses chloramines, ozone, or chlorine dioxide for primary disinfection, the system must also calculate the inactivation logs for viruses and develop an additional disinfection profile for viruses using department-approved methods.

(3) The weekly log inactivations are used to develop a disinfection profile by graphing each log inactivation data point versus time. Each log inactivation serves as a data point in the disinfection profile. The system will have obtained 52 measurements at a minimum, one for each week of the year.

(4) A disinfection profile depicts the variation of microbial inactivation over the course of the year. The system must retain the disinfection profile data both in a graphic form and in a spreadsheet, which must be available for review by the department. This profile is used to calculate a disinfection benchmark if the system is considering changes to its disinfection practices.

43.10(3) *Disinfection benchmark.*

a. Applicability. Any system required to develop a disinfection profile under 43.10(2) must develop a disinfection benchmark prior to making any significant change in disinfection practice. The system must receive department approval before any significant change in disinfection practice is implemented. Records must be maintained according to 43.10(7).

b. Significant changes. Significant changes to disinfection practice include:

(1) Changes to the point of disinfection;

(2) Changes to the disinfectant(s) used in the treatment plant;

(3) Changes to the disinfection process; or

(4) Any other modification identified by the department.

c. Disinfection benchmark calculation. Systems must calculate the disinfection benchmark in the following manner:

(1) Step 1. Using the data collected to develop the disinfection profile, determine the average *Giardia lamblia* inactivation for each calendar month by dividing the sum of all *Giardia lamblia* inactivations for that month by the number of values calculated for that month.

(2) Step 2. Determine the lowest monthly average value out of the 12 values. This value becomes the disinfection benchmark.

d. Information required for department approval of a change in disinfection practice. Systems must submit the following information to the department as part of the consultation and approval process.

(1) A description of the proposed change;

(2) The disinfection profile for *Giardia lamblia* and, if necessary, viruses;

(3) The disinfection benchmark;

(4) An analysis of how the proposed change will affect the current levels of disinfection; and

(5) Any additional information requested by the department.

e. Additional benchmarks if chloramines, ozone, or chlorine dioxide is used for primary disinfection. If a system uses chloramines, ozone, or chlorine dioxide for primary disinfection, the system must calculate the disinfection benchmark from the data collected for viruses to develop a disinfection profile. This viral

benchmark must be calculated in addition to, and in the same manner as, the *Giardia lamblia* disinfection benchmark in 43.10(3)*"c."*

43.10(4) *Combined filter effluent (CFE) turbidity requirements.* All systems using SW or IGW that serve less than 10,000 people must use filtration, and the turbidity limits that must be met depend upon the type of filtration used.

a. Turbidity measurements. Turbidity must be measured in the CFE as described in 43.5(4)*"a"* and *"b."*

b. Turbidity monthly reporting. The monthly reporting requirements are in 43.10(6).

c. Conventional filtration treatment or direct filtration.

(1) The turbidity in the CFE must be less than or equal to 0.3 NTU in 95 percent of the turbidity measurements taken each month.

(2) The turbidity in the CFE must never exceed 1 NTU in two consecutive recordings taken 15 minutes apart during the month. If the CFE turbidity exceeds 1 NTU in two consecutive 15 minute recordings, the system must inform the department as soon as possible, but no later than 24 hours after the exceedance is known, in accordance with the PN requirements under 567—subparagraphs 40.5(3)*"b"*(3) and 40.5(2)*"a"*(8).

d. Slow sand filtration or diatomaceous earth filtration. The CFE turbidity limits of 43.5(3) must be met.

e. Other alternative filtration technologies. By using pilot studies or other means, a system using alternative filtration must demonstrate to the department's satisfaction that the system's filtration, in combination with disinfection treatment, consistently achieves 99 percent removal of *Cryptosporidium* oocysts; 99.9 percent removal, inactivation, or a combination of both, of *Giardia lamblia* cysts; and 99.99 percent removal, inactivation, or a combination of both, of viruses. The department will then use the pilot study data to determine system-specific turbidity limits.

(1) The turbidity must be less than or equal to a value set by the department in 95 percent of the CFE turbidity measurements taken each month, based on the pilot study.

(2) The CFE turbidity must never exceed a value set by the department, based on the pilot study. The value may not exceed 1 NTU in two consecutive recordings taken 15 minutes apart.

43.10(5) *Individual filter turbidity requirements.* All systems utilizing conventional filtration or direct filtration must conduct continuous turbidity monitoring for each individual filter. Turbidity must be monitored according to a written turbidity protocol approved by the department and audited for compliance during sanitary surveys. Major elements of the protocol shall include, but are not limited to: sample measurement location; calibration method, frequency, standards, method of verification, and verification frequency; and data collection, recording frequency, and reporting. Records must be maintained according to 43.10(7).

a. Continuous turbidity monitoring requirements.

(1) Conduct monitoring using an approved method listed in 43.5(4)*"a"*;

(2) Calibrate turbidimeters at least every 90 days with a primary standard. The calibration of each turbidimeter used for compliance must be verified at least once per week with a primary standard, secondary standard, the manufacturer's proprietary calibration confirmation device, or by a department-approved method. If the verification is not within plus or minus 0.05 NTU for measurements of less than or equal to 0.5 NTU, or within plus or minus 10 percent of measurements greater than 0.5 NTU, the turbidimeter must be recalibrated;

(3) Record turbidity monitoring results at least every 15 minutes; and

(4) Complete monthly reporting in accordance with 43.10(6).

b. Equipment failure. If there is a failure in the continuous turbidity monitoring equipment, a system must conduct grab sampling every four hours in lieu of continuous monitoring until the turbidimeter is back on-line. A system has a maximum of 14 days after failure to repair the equipment, or else the system is in violation. The system must notify the department within 24 hours, both when a turbidimeter is taken off-line and when it is returned on-line.

c. Special provision for one-filter or two-filter systems. If a system has only one or two filters, it may conduct continuous monitoring of the CFE turbidity instead of individual effluent turbidity monitoring. The continuous monitoring must meet the requirements in 43.10(5)*"a"* and *"b."*

d. Alternative turbidity levels for systems using lime softening. Systems using lime softening may apply to the department for alternative turbidity exceedance levels for the levels specified in 43.10(5)*"e."* The system must be able to demonstrate to the department's satisfaction that higher turbidity levels are due to lime carryover only, and not due to degraded filter performance.

e. Requirements triggered by individual filter turbidity monitoring data. Systems must conduct additional activities based upon their individual filter turbidity monitoring data, as listed in this paragraph.

(1) If the turbidity of an individual filter (or the CFE turbidity for a system with one or two filters, pursuant to 43.10(5)*"c"*) exceeds 1.0 NTU in two consecutive recordings taken 15 minutes apart, a system must report the following information in the MOR to the department by the tenth day of the following month:

1. The filter number(s);
2. Corresponding date(s);
3. Turbidity value(s) which exceeded 1.0 NTU; and
4. The cause of the exceedance(s), if known.

(2) If the turbidity of an individual filter (or the CFE turbidity for a system with one or two filters, pursuant to 43.10(5)*"c"*) exceeds 1.0 NTU in two consecutive recordings 15 minutes apart in three consecutive months, a system must conduct a self-assessment of the filter(s) within 14 days of the day the filter exceeded 1.0 NTU in two consecutive measurements for the third straight month, unless a comprehensive performance evaluation (CPE) as specified in the following subparagraph is required. Two-filter systems that monitor the CFE turbidity instead of the individual filters must conduct a self-assessment of both filters. The self-assessment must consist of the following:

1. Assessment of filter performance;
2. Development of a filter profile;
3. Identification and prioritization of factors limiting filter performance;
4. Assessment of the applicability of corrections;
5. Preparation of a filter self-assessment report;
6. Date the self-assessment requirement was triggered; and
7. Date the self-assessment was completed.

(3) If the turbidity of an individual filter (or the CFE turbidity for a system with one or two filters, pursuant to 43.10(5)*"c"*) exceeds 2.0 NTU in two consecutive recordings 15 minutes apart in two consecutive months, a system must arrange to have a CPE conducted by the department or a department-approved third party no later than 60 days following the day the filter exceeded 2.0 NTU in two consecutive measurements for the second straight month.

1. The CPE report must be completed and submitted to the department within 120 days following the day the filter exceeded 2.0 NTU in two consecutive measurements for the second straight month.
2. A new CPE is not required if a CPE has been completed by the department or a department-approved third party within the prior 12 months, or if the system and department are jointly participating in an ongoing comprehensive technical assistance project at the system.

(4) The department may conduct a CPE at a system regardless of individual filter turbidity levels.

43.10(6) *Reporting requirements.* Systems must report as follows:

a. CFE turbidity monitoring.

(1) The following information must be reported in the MOR to the department by the tenth day of the following month:

1. Total number of filtered water turbidity measurements taken during the month;
2. The number and percentage of filtered water turbidity measurements taken during the month that are less than or equal to the system's required 95th percentile limit;
3. The date and analytical result of any turbidity measurements taken during the month that exceeded the maximum turbidity limit for the system, in addition to the requirements of 43.10(6)*"a"*(2); and
4. The dates and summary of calibration and verification of all compliance turbidimeters.

(2) For an exceedance of the CFE maximum turbidity limit, as described below, the system must consult with the department as soon as practical, but no later than 24 hours after the exceedance is known, in accordance with the PN requirements under 567—subparagraph 40.5(3)*"b"*(3). Consultation is required if at any time the turbidity in representative samples of filtered water exceeds:

1. 1 NTU in the CFE in two consecutive recordings taken 15 minutes apart for systems using conventional filtration treatment or direct filtration;
2. The maximum level under 43.5(3) for slow sand filtration or diatomaceous earth filtration; or
3. The maximum level in 43.10(4)*"c"* for filtration technologies other than conventional filtration treatment, direct filtration, slow sand filtration, or diatomaceous earth filtration.

b. Individual filter effluent (IFE) turbidity monitoring. The following information must be reported in the MOR to the department by the tenth day of the following month, unless otherwise noted.

(1) That the system conducted individual filter turbidity monitoring during the month.

(2) For any filter that had two consecutive measurements taken 15 minutes apart that exceeded 1.0 NTU:

1. The filter number(s);
2. The corresponding dates;
3. The turbidity values that exceeded 1.0 NTU; and
4. The cause, if known, of the exceedance.

(3) If a self-assessment was required, the date it was triggered, and the date the assessment was completed. If the self-assessment requirement was triggered in the last four days of the month, the information must be reported to the department by the 14th day of the following month.

(4) If a CPE was required, the date it was triggered. A copy of the CPE report must be submitted to the department within 120 days of when the CPE requirement was triggered.

(5) The dates and summary of calibration and verification of all compliance turbidimeters.

c. Disinfection profiling. The following information must be reported to the department by January 1, 2004, for systems serving fewer than 500 people.

(1) Results of DBP monitoring that indicate TTHM levels less than 0.064 mg/L and HAA5 levels less than 0.048 mg/L; or

(2) That the system has begun to collect the profiling data.

d. Disinfection benchmarking. Before a system that was required to develop a disinfection profile makes a significant change to its disinfection practice, it must report the following information to the department, and the system must receive department approval before any significant change in disinfection practice is implemented.

(1) Description of the proposed change in disinfection practice;

(2) The disinfection profile for *Giardia lamblia* and, if applicable, for viruses;

(3) The disinfection benchmark; and

(4) An analysis of how the proposed change will affect the current disinfection levels.

43.10(7) *Recordkeeping requirements.* Systems must meet the following recordkeeping requirements, in addition to the recordkeeping requirements in 567—paragraph 40.8(3)*"c"* and rule 567—40.9(455B).

a. IFE turbidity. The results of the IFE turbidity monitoring must be kept for at least three years.

b. Disinfection profiling and benchmarking. The results of the disinfection profile and disinfection benchmark, including raw data and analysis, must be kept indefinitely.

[**ARC 9397C**, IAB 7/9/25, effective 8/13/25]