OAC Ann. 3745-81-72

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Ohio Administrative Code > ***3745 Ohio Environmental Protection Agency*** > ***Chapter 3745-81 Primary Drinking Water Rules***

3745-81-72. Disinfection of water from surface water sources.

"Disinfection practice" means the application of a ***disinfectant*** to the treatment flow for the purpose of meeting CT requirements of this rule. Significant changes to disinfection practice include any change which will affect the ability of a system to meet the CT requirements of this rule.

(A) A public water system that uses a surface water source, in whole or in part, shall provide the disinfection treatment specified in paragraph (B) of this rule no later than eighteen months following designation by the director as a surface water source. Failure to meet any requirement of this rule, excluding paragraph (E) of this rule, is a treatment technique violation for which public notification is required under rule *3745-81-32 of the Administrative Code*. Failure to meet any requirement of paragraph (E) of this rule is a monitoring violation for which public notification is required under rule *3745-81-32 of the Administrative Code*. A public water system that uses a surface water source, in whole or in part, and does not already provide filtration treatment shall comply with any interim disinfection requirements established by the director before filtration is installed.

(B) Each public water system that uses a surface water source, in whole or in part, shall provide disinfection treatment of the water as follows:

(1) The disinfection treatment shall be considered sufficient if the total treatment processes of that public water system would consistently and reliably achieve at least 99.9 per cent (3 log) inactivation and/or removal of Giardia lamblia cysts and at least 99.99 per cent (4 log) inactivation and/or removal of viruses, as determined from table A, and tables B-1 to B-13 of this rule or tables under paragraph (N) of rule *3745-81-68 of the Administrative Code*. The inactivation by disinfection is calculated from the actual CT divided by the required CT during the peak hourly flow of each day that the public water system is in operation.

(2) Table A of this rule lists: the minimum requirement for inactivation and/or removal of Cryptosporidium, Giardia lamblia and viruses; the extent to which a properly operated conventional filtration treatment, direct filtration, and slow sand filtration are considered sufficient to remove Cryptosporidium, Giardia lamblia, and viruses; and the minimum disinfection needed to complete the required minimum inactivation and/or removal of Cryptosporidium, Giardia lamblia and viruses. Table A specifies the additional minimum log inactivation of Giardia lamblia and viruses by disinfection if filtration is properly operated and the turbidity treatment technique requirements of rule *3745-81-73 of the Administrative Code* are satisfied. The filtration and disinfection treatment shall include disinfection that consistently and reliably achieves at least the minimum log inactivation by disinfection of Giardia lamblia and viruses as specified in table A..

(3) The ***residual*** ***disinfectant*** concentration in the water entering the distribution system shall not be less than 0.2 milligram per liter free chlorine or one milligram per liter combined chlorine for more than four consecutive hours.

(4) The ***residual*** ***disinfectant*** concentration in the distribution system shall not be less than 0.2 milligram per liter free chlorine or one milligram per liter combined chlorine in more than five per cent of the samples each month for any two consecutive months that the public water system serves water to the public.

(C) Disinfection treatment sufficiency determination.

(1) Paragraph (B)(1) of this rule requires a minimum percentage of inactivation and/or removal of Giardia lamblia and viruses in water obtained at least partly from a surface water source. Because of the difficulties in measuring the concentrations of viable Cryptosporidium, Giardia lamblia, and viruses, maximum contaminant levels are not practical and treatment technique requirements are used to ensure control of these contaminants in drinking water. For ***disinfectants*** other than UV, tables B-1 to B-13 of this rule shall be used to determine the sufficiency of disinfection. This determination is made at the peak hourly flow rate of each day the water system is in operation. Systems using UV to comply with the inactivation requirements of this rule shall meet paragraph (N) of rule *3745-81-68 of the Administrative Code*.

(2) For ***disinfectants*** other than UV, the level of inactivation being provided by the system is determined by measuring actual CT values. The level of inactivation being provided by a system using UV is determined by the UV dosage. For systems using chlorine dioxide or ozone to comply with the additional Cryptosporidium treatment requirements in paragraph (E) of rule *3745-81-67 of the Administrative Code*, unfiltered water flow may be used to achieve the additional treatment credit if approved by the director.

Only filtered water flow shall be used in the required CT calculations to meet the minimum log inactivation in table A of this rule, regardless of the ***disinfectant*** used. For systems using chlorine dioxide or ozone to comply with additional Cryptosporidium treatment requirements in paragraph (E) of rule *3745-81-67 of the Administrative Code*, unfiltered water flow may be used in the required CT calculations if approved by the director.

Actual CT values are obtained by multiplying the ***residual*** ***disinfectant***, C, by the disinfection contact time, T, giving the resultant, CT. The value of C in milligrams per liter is determined at a point before or at the first customer. The value of T in minutes is based on the time available for the ***disinfectant*** to work from the point at which it is added to the water until the point at which C is measured. Values of T are determined based on the approved effective volume factor of the clearwell or contact tank. It may be appropriate to determine the value of C at more than one point of the water treatment flow, with the T associated with each C being estimated from the previous measurement point or the previous addition of ***disinfectant***, which ever is closer. If more than one ***disinfectant*** concentration point is used, the products of each C and its associated T are added and the sum of these products is the actual CT value to compare with the appropriate value of the required minimum CT values for specified conditions and levels of inactivation in the following tables. Note that any disinfection after the last determination of C is not included in the actual CT value. Minimum required CT values for inactivation of Giardia lamblia and viruses by disinfection in relation to the ***disinfectant***, the extent of inactivation, the ***disinfectant*** concentration, the pH, and the water temperature at the peak hourly flow rate for each day of operation are found in tables B-1 to B-13 of this rule. Applicable information for UV is found in paragraph (N) of rule *3745-81-68 of the Administrative Code*.

(3) In tables B-1 to B-13 of this rule, the required CT between the indicated pH or ***residual*** ***disinfectant*** concentration may be determined by linear interpolation. The required CT between the indicated temperatures of different tables may be determined by linear interpolation.

If no interpolation is used, then the required CT shall be determined at the lower temperature, and at the higher pH, and at the higher ***residual*** ***disinfectant*** concentration. For Giardia lamblia

inactivation at a pH greater than nine, the required CT shall be the same as the required CT at a pH equal to nine. For virus inactivation at a pH greater than nine, the required CT shall be the same as the required CT at a pH equal to ten.

(4) On each day when the actual CT value meets or exceeds the required minimum CT value in or linearly interpolated from tables B-1 to B-13 of this rule for chlorine, chlorine dioxide, ozone, or chloramines, or the table in paragraph (N) of rule *3745-81-68 of the Administrative Code* for UV disinfection, then the water treatment plant is considered to be satisfying treatment technique requirements of this rule for disinfection of surface water sources. On each day when the actual CT value does not meet or exceed the required minimum CT value from tables B-1 to B-13 of this rule, then the water treatment plant is in violation of paragraph (B)(1) of this rule.

(5) For each clearwell, or contact tank, the approved effective volume factor shall be determined by the director based upon its design characteristics including: the average flow path length to channel width ratio; baffling; and the proximity of the outlet to the inlet using figures B-1 and B-2 of this rule. The approved effective volume factor shall be the preliminary effective volume factor obtained from figure B-1 of this rule multiplied by the reduction factor obtained from figure B-2 of this rule, rounded down to the nearest 0.05. A public water system may request that the director approve an effective volume factor that was determined by tracer studies, hydraulic analysis or modeling, or an equivalent demonstration. For a tracer study to be acceptable, the net advection of the tracer shall be within ten per cent of the change in the tracer chemical storage within the clearwell system. Net advection means the amount of tracer convected out of the clearwell system minus the amount of tracer convected into the clearwell system over the duration of the tracer study.

[Note: Refer to the appendix to this rule for more information on how to determine disinfection sufficiency.]

(D) A public water system that serves a population of at least ten thousand persons and was required to develop a disinfection profile or benchmark under *40 CFR 141.172* or *40 CFR 141.170(d)*, or a community or nontransient noncommunity public water system that serves a population of less than ten thousand persons and was required to develop a disinfection profile or benchmark under *40 CFR 141.530*, shall follow these requirements:

(1) Prior to making a significant change in its disinfection practice, the public water system shall submit the disinfection profile to the director for review and consultation. Such changes may require approval if determined substantial by the director as specified by rule *3745-91-02 of the Administrative Code*. Significant changes to disinfection practice include any of the following:

(a) Changes to the point of disinfection;

(b) Changes to the ***disinfectant*** used in the treatment plant;

(c) Changes to the disinfection process; and

(d) Any other modification identified by the director, including those identified and proposed in a general plan required by paragraph (A)(7) of rule *3745-81-24 of the Administrative Code*.

[Comment: The *40 CFR 141.172*, *40 CFR 141.170(d)*, and *40 CFR 141.530* refer to the "Code of Federal Regulations" published on July 1, 2012. At the effective date of this rule, a copy may be obtained from the "Superintendent of Documents, PO Box 371954, Pittsburgh, PA 15250-7954," (866) 512-1800, or *http://bookstore.gpo.gov*. This document is available for

review at "Ohio EPA, Lazarus Government Center, 50 West Town Street, Columbus, OH, 43215-3425."]

(2) The public water system shall calculate its disinfection benchmark using the following procedure:

(a) The disinfection benchmark is the lowest monthly average value (for public water systems with one year of profiling data) or average of lowest monthly average values (for public water systems with more than one year of profiling data) of the monthly logs of Giardia lamblia inactivation in each year of profiling data.

(b) For each year of profiling data collected and calculated, the public water system shall determine the lowest average monthly Giardia lamblia inactivation in each year of profiling data. The average Giardia lamblia inactivation shall be determined by dividing the sum of Giardia lamblia inactivation values by the number of values calculated for that month. For public water systems with a combined population of at least ten thousand persons, daily values shall be used. For public water systems with a combined population less than ten thousand persons, weekly values may be used. Values for each calendar month for each year of profiling data shall be used in the calculation.

(3) A public water system that uses chloramines, chlorine dioxide, or ozone for primary disinfection shall also calculate the disinfection benchmark for viruses using a method acceptable to the director.

(4) Prior to making a significant change, the public water system shall submit the following information for review by the director:

(a) A description of the proposed change;

(b) The disinfection profile for Giardia lamblia (and, if necessary, viruses) and disinfection benchmark; and

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

(5) The public water system shall retain the disinfection profile data in graphic form, as a spreadsheet, or in some other format acceptable to the director for review as part of a sanitary survey. The disinfection profile, disinfection benchmark, and all data and analysis used to complete the disinfection profile shall be retained by the public water system indefinitely.

(E) Disinfection profiling and benchmarking requirements for any system making a significant change to their disinfection practice.

(1) Following the completion of initial source water monitoring in accordance with paragraph (A) of rule *3745-81-65 of the Administrative Code*, a system that plans to make a significant change to its disinfection practice, as defined in paragraph (E)(2) of this rule, shall develop disinfection profiles and calculate disinfection benchmarks for Giardia lamblia and viruses as described in paragraphs (E)(3) to (E)(7) of this rule. Prior to changing the disinfection practice, the system shall notify the director and shall include in this notice the following information:

(a) A completed disinfection profile and disinfection benchmark for Giardia lamblia and viruses as described in paragraphs (E)(3) to (E)(7) of this rule.

(b) A description of the proposed change in disinfection practice.

(c) An analysis of how the proposed change will affect the current level of disinfection.

(2) Significant changes to disinfection practices include any of the following:

(a) Changes to the point of disinfection;

(b) Changes to the ***disinfectant*** used in the treatment plant:

(c) Changes to the disinfection process; or

(d) Any other modification identified by the director as a significant change to disinfection practice.

(3) Systems required to develop disinfection profiles in accordance with paragraphs (E)(1) and (E)(2) of this rule shall monitor at least weekly for a period of twelve consecutive months to determine the total log inactivation for Giardia lamblia and viruses. If systems monitor more frequently, the monitoring frequency shall be evenly spaced. Systems that operate for fewer than twelve months per year shall monitor weekly during the period of operation. Systems shall determine log inactivation for Giardia lamblia and viruses through the entire plant, based on CT99.9 values in tables B-1 to B-13 of this rule , as applicable. Systems shall determine log inactivation of viruses through the entire treatment plant based on a protocol accepted by the director.

(4) Systems with a single point of ***disinfectant*** application prior to the entrance to the distribution system shall conduct the monitoring in this paragraph. Systems with more than one point of ***disinfectant*** application shall conduct the monitoring in this paragraph for each disinfection segment. Systems shall monitor the parameters necessary to determine the total inactivation ratio, using analytical methods in accordance with paragraph (C) of rule *3745-81-27 of the Administrative Code*.

(a) For systems using a ***disinfectant*** other than UV, the temperature of the disinfected water shall be measured at each ***residual*** ***disinfectant*** concentration sampling point during peak hourly flow or at an alternative location accepted by the director.

(b) For systems using chlorine, the pH of the disinfected water shall be measured at each chlorine ***residual*** ***disinfectant*** concentration sampling point during peak hourly flow or at an alternative location accepted by the director.

(c) The ***disinfectant*** contact time(s), T, shall be determined during peak hourly flow.

(d) The ***residual*** ***disinfectant*** concentration(s), C, of the water before or at the first customer and prior to each additional point of ***disinfectant*** application shall be measured during peak hourly flow.

(5) In lieu of conducting new monitoring under paragraph (E)(4) of this rule, systems may elect to meet the requirements of paragraph (E)(5)(a) or (E)(5)(b) of this rule.

(a) Systems that have at least one year of existing data that are substantially equivalent to data collected under the provisions of paragraph (E)(4) of this rule may use these data to develop disinfection profiles as specified in this rule if the system has neither made a significant change to the treatment practice nor changed sources since the data were collected. Systems may develop disinfection profiles using up to three years of existing data.

(b) Systems may use disinfection profile(s) developed in accordance with paragraph (D) of this rule in lieu of developing a new profile if the system has neither made a significant change to the treatment practice nor changed sources since the profile was developed. Systems that have not developed a virus profile under paragraph (D) of this rule shall develop a virus profile using the same monitoring data on which the Giardia lamblia profile is based.

(6) Systems shall calculate the total inactivation ratio for Giardia lamblia as specified in paragraphs (E)(6)(a) to (E)(6)(c) of this rule.

(a) Systems using only one point of ***disinfectant*** application may determine the total inactivation ratio for the disinfection segment based on either of the following methods:

(i) Determine one inactivation ratio (CTcalc/CT99.9) before or at the first customer during peak hourly flow.

(ii) Determine successive CTcalc/CT99.9 values, representing sequential inactivation ratios, between the point of ***disinfectant*** application and a point before or at the first customer during peak hourly flow. The system shall calculate the total inactivation ratio by determining (CTcalc/CT99.9) for each sequence and then adding the (CTcalc/CT99.9) values together to determine ((CTcalc/CT99.9)).

(b) Systems using more than one point of ***disinfectant*** application before the first customer shall determine the CT 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 (CTcalc/CT99.9) value of each segment and ((CTcalc/CT99.9)) shall be calculated using the method in paragraph (E)(6)(a)(ii) of this rule.

(c) The system shall determine the total logs of inactivation by multiplying the value calculated in paragraph (E)(6)(a) or (E)(6)(b) of this rule by 3.0.

(d) Systems shall calculate the log of inactivation for viruses using a protocol approved by the director.

(7) Systems shall use the following procedures to calculate a disinfection benchmark.:

(a) For each year of profiling data collected and calculated under paragraphs (E)(3) to (E)(6) of this rule, systems shall determine the lowest average monthly level of both Giardia lamblia and virus inactivation. Systems shall determine the average Giardia lamblia and virus inactivation for each calendar month for each year of profiling data by dividing the sum of daily or weekly Giardia lamblia and virus log inactivation by the number of values calculated for that month.

(b) The disinfection benchmark is the lowest monthly average value (for systems with one year of profiling data) or the average of the lowest monthly average values (for systems with more than one year of profiling data) of Giardia lamblia and virus log inactivation in each year of profiling data. Click here to view image. Click here to view image. Click here to view image. Click here to view image. Click here to view image. Click here to view image. Click here to view image. Click here to view image. Click here to view image. Click here to view image. Click here to view image. Click here to view image. Click here to view image.

Statutory Authority

Promulgated Under:

119.03.

Statutory Authority:
6109.04.

Rule Amplifies:
6109.03, 6109.04.

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OHIO ADMINISTRATIVE CODE
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Ohio Administrative Code > ***3745 Ohio Environmental Protection Agency*** > ***Chapter 3745-83 Operational Requirements***

3745-83-01. Operational requirements.

(A) Except as otherwise noted, the definitions in rule *3745-81-01 of the Administrative Code* shall apply to this chapter.

(B) Except as otherwise noted, analyses required by this rule shall be conducted in accordance with methods as specified in rule *3745-81-27 of the Administrative Code*. In addition, analysis for parameters listed in the table in this paragraph shall be conducted in a laboratory certified in accordance with *Chapter 3745-89 of the Administrative Code*: Click here to view image.

(C) Disinfection.

(1) Except as prescribed in rule *3745-81-72 of the Administrative Code*, noncommunity public water systems serving a population of at least one thousand people and all community public water systems shall maintain a minimum chlorine residual of at least two-tenths milligram per liter free chlorine, or one milligram per liter combined chlorine measured at representative points throughout the distribution system. The director may require higher residuals as necessary to compensate for pH, temperature, or other characteristics of the delivered water.

[Comment: Rule *3745-81-72 of the Administrative Code* establishes similar but separate requirements for disinfection of systems using a surface water source. These two requirements are not inconsistent and failure to comply with either is considered a separate violation with different consequences. Contact your district office representative if you have questions or require clarification.]

(2) Each water system subject to paragraph (C)(1) of this rule shall install and place in operation equipment capable of meeting disinfection requirements of this rule.

(3) A system is exempt from paragraphs (C)(1) and (C)(2) of this rule if, with written approval of the director, it uses chlorine dioxide as a primary or supplementary disinfectant in accordance with the terms of the approval.

(4) At times of actual or threatened outbreak of waterborne disease as defined in rule *3745-81-01 of the Administrative Code*, or water supply emergency as determined by the director in accordance with *section 6109.05 of the Revised Code*, the director may require a public water system subject to paragraph (C)(1) of this rule to maintain a minimum chlorine residual of at least one milligram per liter free chlorine, or six milligrams per liter combined chlorine measured at representative points throughout the distribution system, despite possible resulting tastes or odors in the delivered water.

(5) "Finished water storage facilities," means a tank, reservoir, or other facility used to store water that will undergo no further treatment except residual disinfection, aeration or recirculation. Finished water storage facilities serving noncommunity water systems serving a population of at least one thousand people and all community water systems, prior to being placed into service or being returned to service after repairs, inspections, painting, cleaning, or other activities that might lead to contamination, shall:

(a) Meet the requirements of "American Water Works Association Standard C652-02 Disinfection of Water-Storage Facilities" (2002); and

(b) Be monitored for chlorine residual and comply with the minimum chlorine residual established in paragraph (C)(1) of this rule and the MRDL established in paragraph (C) of rule *3745-81-10 of the Administrative Code*.

(6) Water mains serving noncommunity water systems serving a population of at least one thousand people and all community water systems, prior to being placed into service or being returned to service after repairs, inspections, or other activities that might lead to contamination, unless a minimum pressure of twenty pounds per square inch gauge at ground level is maintained at all points in the distribution system, shall:

(a) Meet the requirements of "American Water Works Association Standard C651-05 Disinfecting Water Mains" (2005); and

(b) Be monitored for chlorine residual and comply with the minimum chlorine residual established in paragraph (C)(1) of this rule and the MRDL established in paragraph (C) of rule *3745-81-10 of the Administrative Code*.