



Surface Water Treatment Rule: How to Compute Contact Time

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.

What is Contact Time?

Contact time is a measurement of the length of time it takes for chlorine (most commonly used water treatment disinfectant) or other disinfectants to kill *giardia lamblia* at a given disinfectant concentration. An operator measures the amount of contact time available at the plant before the water goes out to the public to ensure that 99.9% of *giardia lamblia* is either removed with filtration or inactivated with chlorine before the water gets to the public. The operator compares the contact time at the plant to the CT tables provided by the EPA in Appendix E of the Guidance Manual for given water quality conditions. As long as the contact time the operator measures at the plant is greater than that required by the EPA, the water passes the disinfection portion of the treatment process.

The steps below have been set up to help operators determine contact time.

Step 1: Determine the time available in the basin at peak flow

Multiply the basin volume by the baffling factor and divide by the Peak Hourly Flow to determine the Time portion of the contact time equation.

$$\text{Time (min)} = \frac{\text{basin volume (gallons)} \times \text{baffling factor}}{\text{Peak Hourly Flow (gallons per minute)}}$$

Step 2: Determine the contact time available at peak flow

Multiply the Time by your chlorine concentration at peak hourly flow. This is the Contact Time you have available.

$$\text{Available Contact Time (min mg/l)} = \text{Time (min)} \times \text{Chlorine concentration (mg/l)}$$

Step 3: Find the required Contact Time (CT) from the tables at peak flow

Determine the CT required by the Environmental Protection Agency. You need to do this by looking up the CT from the CT tables provided in the EPA Appendix E of the Guidance Manual using your pH, temperature and chlorine concentration.

Step 4: Does your water system meet CT requirements?

Compute the inactivation ratio by dividing the actual contact time by required contact time. If the ratio is greater than 1, then your water system met its contact time requirements. If you cannot meet contact time, you can either increase your storage volume or increase your disinfectant residual.

$$\text{Inactivation ratio} = \frac{\text{actual contact time}}{\text{required contact time}}$$

Example:

Your campground has a 5,000 gallon steel tank. An engineer has determined that the baffling factor for the tank is 0.3. The flow of water through the system is determined to be 15 gallons per minute at maximum flow conditions. The pH is 7.0 and the temperature is 10 Celsius. Determine whether or not your campground meets contact time requirements at 1.5 mg/l chlorine.

Step 1: Time is equal to 5,000 gallons x 0.3 (baffling factor) to get a working contact volume of 1500 gallons (assuming the tank is full to capacity). Divide 1,500 gallons by the peak hourly flow of 15 gallons per minute to get 100 minutes of time available.

Step 2: Your contact time is 100 minutes x 1.5 mg/l. This is equal to 150 min. mg/l of available contact time.

Step 3: Look up the contact time that you need to achieve from the tables. Find the 10 C table at 7.0 pH. 1.5 mg/l is not listed, so use the next lowest chlorine residual, 1.4 mg/l. The CT required for compliance, from the table, is 58 min. mg/l.

Step 4: Is the inactivation ratio greater than 1? Divide 150 by 58, to get 2.6. 2.6 is greater than 1, so yes, your system did meet contact time requirements.