Ground Water Rule

Public Water System Declaration on 4-log Virus Treatment

PWSID Number:	< PWS ID>
System Name:	<System Name>
Contact Person:	<Contact Person>
Phone Number:	<Phone Number>

Does Your System Provide 4-log Treatment of Viruses?

If your system disinfects with gaseous or liquid chlorine, use the calculation below to determine the CT that is provided for your ground water. "CT" is an abbreviation for chlorine Concentration multiplied by Time. Since the temperature of the groundwater in the CNMI is consistently above 25ºC throughout the year, and the pH of the groundwater is between 6.0 and 9.0, a CT of 2.0 (or greater) is required in the CNMI to provide 4-log inactivation of viruses. An example of a CT = 2.0 is if the chlorine residual is 0.5 mg/l (C=0.5) at the first user and the time the chlorine is in contact with the water is 4.1 minutes (T=4.1), then C x T = 0.5 x 4.1 = 2.05 which is greater than 2.0.

To calculate your system's CT, multiply the free chlorine residual (in mg/L) at your first user's service connection by the shortest amount of time (in minutes) water comes into contact with the chlorine.

The free chlorine residual (mg/L) at the first user is: C = _____

The shortest amount of time (minutes)
the water is in contact with the chlorine is: T = _____

Multiply C _____ x T _____ CT = _____

Is your system's CT _____ = 2.0 circle YES or NO

If your answer is YES, then your system provides 4-log virus treatment for its groundwater source. If your answer is NO, then your system does not provide 4-log virus treatment for its groundwater source.

If your system uses a different kind of disinfection (e.g., UV, ozone, chloramines) and/or filters it s ground water, call the Safe Drinking Water program at 664-8500. We will work with you to determine how many logs of virus treatment your system provides.

Check the line below that applies to your ground water system:

_____ **Our ground water system probably does not provide 4-log treatment of viruses**
_____ **Our groundwater system probably provides 4-log treatment of viruses**
_____ **We do not know if our groundwater system provides 4-log treatment of viruses**

Please return this form to: Division of Environmental Quality, P.O. Box 501304, Saipan, MP 96950; or fax to 664-8540; or drop off at the DEQ office in Gualo Rai, Saipan.

Water System Representative: _________________________ date: _______________

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You may want to draw a simple schematic of your water system showing where the chlorine is added to the water, the size of any storage tanks that hold chlorinated water and how far it is from the chlorination point to the first user. See below for examples of how to calculate CT.

Your water system schematic and CT calculation

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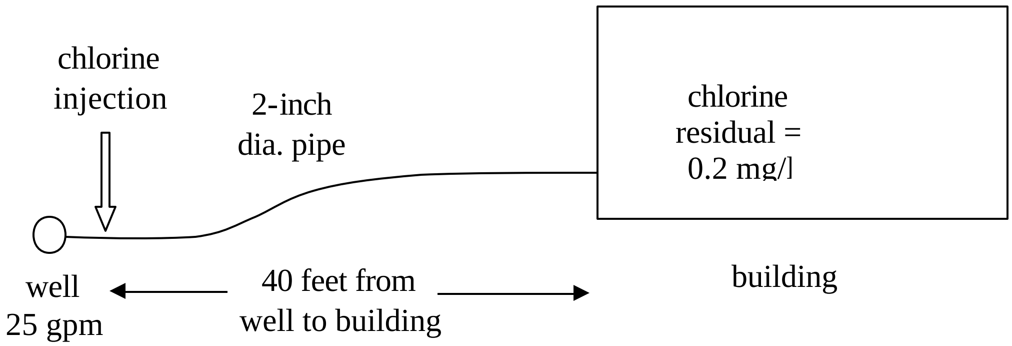
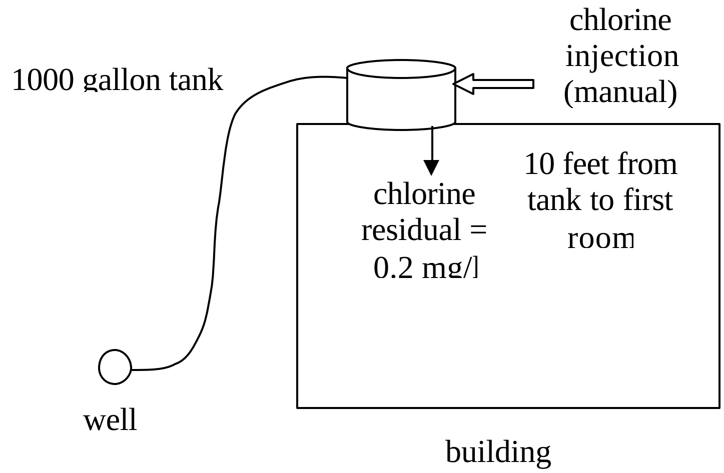
The following are several examples of Public Water Systems in the CNMI, and how the CT and/or 4-log virus treatment is determined for each system.

Example 1: A system injects a chlorine solution into the pipe immediately after the water is pumped from the well. The water goes directly to the building plumbing from the well. The well is 40 feet from the building. The pipe from the well to the building is 2-inch in diameter. The chlorine residual at the first "user" in the building is 0.2 mg/l.



The free chlorine residual at the first user is 0.2 mg/L so C = 0.2
The time that the chlorine is in contact with the water before the first user is the time it takes for the water to flow from the chlorine injection point to the first user. The water is flowing at 25 gal per minute in a 2-inch diameter pipe 40 feet long. The volume of water in the pipe = $(0.785)(D)^2(L) = (0.785)(2/12\ ft)^2(40\ ft) \times 7.481\ gal/ft^3 = 6.5$ gallons. To find out how long it takes the water to get from the chlorine injection point to the building, take 6.5 gallons divided by 25 gallons/minute = 0.26 minutes. So T = 0.26
C x T = 0.2 x 0.26 = 0.052 which is less than 2.0, so this system does NOT provide 4-log virus treatment. [For this system to provide 4-log virus treatment, it either has to increase the chlorine dosage, or slow down the pumping rate from the well. For instance if the well pump rate was slowed to 5 gpm and the chlorine residual was 1.6 mg/L then C = 1.6 and T = 6.5 gallons / 5 gallons per minute = 1.3 and C x T = 1.6 x 1.3 = 2.4 which is greater than 2.0, so the system would provide 4-log removal of viruses.]

Example 2: A system pumps water from a well to a 1,000 gallon tank on the roof. The system only pumps water into the tank when the water level in the tank falls below half the level of the tank. The system manually adds chlorine to the tank each time it fills the tank with water. The chlorine residual at the first "user" (room) in the building is 0.2 mg/l. The first room is 10 feet away from the tank (below the tank), and the water flows by gravity to the first user through ½ diameter pipe.



Since the chlorine residual is 0.2 mg/L at the first user, then C = 0.2
In this case it is hard to determine the T because there is no exact flow rate from the tank to the faucet in the first room. The 10 foot long ½ inch pipe from the tank to room has a negligible volume (only 0.1 gallons). But some credit can be given for the volume of water in the tank. EPA guidance allows a credit of 10% of the volume of the tank for a tank that does not have any baffling. 1,000 gallon tank x 10% = 100 gallons. Assume the flow rate to the first room is 1 gpm (a typical faucet). Then the time the chlorine is in contact with the water before it reaches the first customer is 100 gallons divided by 1 gal/minute = 100 minutes. So T = 100. C x T = 0.2 x 100 = 20, which is greater than 2.0. This system provides 4-log virus treatment.

Further discussion: It is difficult to judge the actual T in the situation above. To ensure that a CT of 2.0 is achieved, an operator may choose to hold the water in the storage tank for a definite period of time after adding the chlorine, before releasing it into the distribution system. For example if the chlorine residual of the water was 0.2 mg/L and the water was held in the tank for at least 10 minutes before being released, then the CT would be C x T = 0.2 x 10 = 2.0. In this case the contact time and residual are assured to meet the minimum of 2.0 for the 4-log virus treatment.

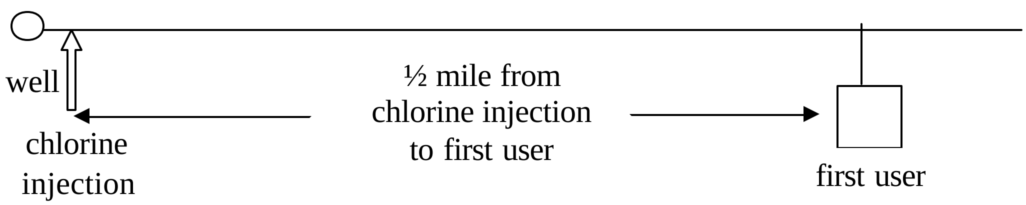
Example 3: A system gets groundwater from another PWS, but adds additional chlorine to the water before distributing the water to its users.

If the upstream (wholesale) PWS has declared that they achieve 4-log virus treatment, then the consecutive system also achieves 4-log virus treatment. No further calculation is necessary. If the wholesale system has not declared that they achieve 4-log virus treatment, then the consecutive system will want to calculate the CT based on the point at which they add the chlorine, and the chlorine residual and the time to the first user.

Example 4: A bottled water company filters well water through a reverse-osmosis system, then disinfects the water with UV, before sending it to a product storage tank.

The system does not get any credit for virus treatment from the UV disinfection system. There are viruses that are resistant to UV. The system may get 4-log virus removal credit for the reverse-osmosis filtration system DEQ will approve the filtration process credit on a case-by-case basis.

Example 5: A CUC well pumps at 50 gpm into a 4-inch transmission line. The water is chlorinated at the well. The first user is ½ mile from the well. The chlorine residual at the first user is 0.5 mg/L.



C = 0.5
The transmission line from the well to the first user contains $(0.785)(D)^2(L)$ = $(0.785)(4/12\text{ft})^2(5{,}280\text{ ft/mile} \times 0.5\text{ mile}) \times 7.481\text{ gal/ft}^3$ = 1,723 gallons. The time from the chlorine injection to the first user is 1,723 gallons / 50 gal/min = 34 minutes. T = 34
CT = C x T = 0.5 x 34 = 17 which is greater than 2.0, so this system meets the 4-log virus treatment.