OCT Academy
www.octinc.com
Toll Free
1-866-266-0028
Local
(916) 640-1823
5840 Price Ave.
McClellan, CA. 95652

C•t Formulas and EPA Table E Values

(The C•t for Giardia Lamblia inactivation is the Controlling C•t since it is greater than the C•t for Virus inactivation.)

EPA Power Equation

For free Cl_2, $\leq 5^o$ C, 3 Logs of Inactivation Only

$$C \bullet t = (0.9487) \times (C^{0.1758}) \times (pH^{2.7519}) \times \left(\frac{1}{T^{0.1467}} \right)$$

Where: C = Cl_2, mg/L
T = Temperature, C°

Table E Calculations

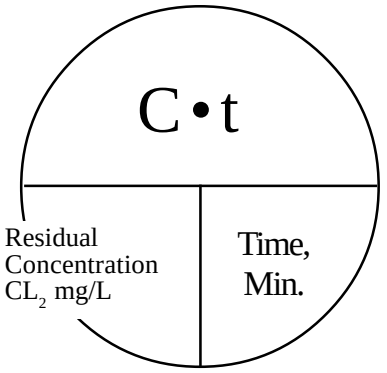
C•t = (Cl_2 Residual, mg/L) x (Time, Minutes)

$$\text{Time, Min} = \frac{(\ C \bullet t\ )}{(\ Cl_2 \text{ Residual, mg/L }\ )}$$

$$(\ Cl_2 \text{ Residual, mg/L }\ ) = \frac{(\ C \bullet t\ )}{(\ \text{Time, minutes})}$$

Table E Calculations

Giardia	3.0 Logs	99.9% Removal
Viruses	4.0 Logs	99.99% Removal
Cryptosporidium	2.0 Logs	99.9% Removal



Plant Credit

	Giardia	Viruses	Additional Disinfection Required
Conventional Surface Water	2.5 Logs	2.0 Logs	0.5 Logs - G 2.0 Logs - V
Slow Sand Filter Direct Filtration Diamtomaceous Earth	2.0 Logs	1.0 Logs	1.0 Log - G

Inactivation Ratio

$$\frac{\textbf{Calculated C•t}}{\textbf{Required C•t}} = \geq \textbf{1.0}$$

Adjustments for Temperatures & pH between Tables

Temperature - If the temperature is between Table Values, go to the next lower temperature page.

pH - If the pH is between Table Values, go to the next higher pH table.

Table E Calculations

a) Determine System GPM = $\frac{\text{(Plant / System Capacity, GPD)}}{\text{(1,440 min / day)}}$

b) Determine Additional Contact Time, minutes = $\frac{\text{(Additional Volume, gallons)}}{\text{(Plant / System, GPM, see above)}}$

c) Calculate Additional = ($C1_2$ Residual, mg/L) x (Time, minutes)

d) Calculate C•t Inactivation = $\frac{\text{(Calculated C•t)}}{\text{(Required C•t)}}$ for the Additional Volume

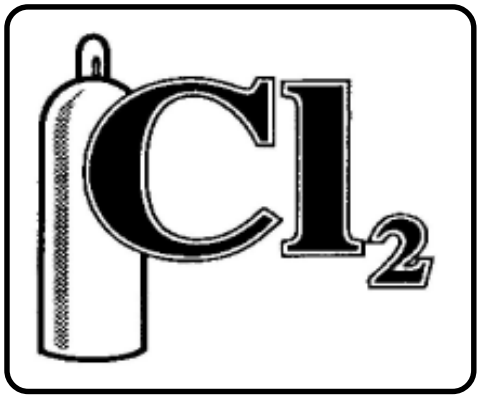
e) Calculated New Combined = $\frac{\text{(Calculated C•t for A + B)}}{\text{(Required C•t)}}$ Inactivation Ratio

f) If the new result is > 1.0, the require C•t has been met.

T_{10} Value - Determine the C•t

T_{10} Value, minutes x C•t Residual, mg/L = Calculated C•t

T = $\frac{\text{(Volume of the pipe, gallons)}}{\text{(Peak Hourly flow, GPH)}}$



The information on this card relates to 99.9% inactivation of *Giardia* cysts by free chlorine.
The alternative disinfectants which generate their own C•t's include:
Chlorine Dioxide, Ozone
Chloramines, Ultra Violet

Log Removal As A Function of % Removal

1. Make a decimal fraction = $\frac{\text{(Percentage of removal)}}{100}$

2. Log Removal = A) 1 - decimal fraction = X

3. Log Removal = (-) x (- log removal shown in step # 2)

Example:
Given % Removal = 99.64

Make a decimal fraction = $\frac{\text{(99.64 \%)}}{100}$

Make a decimal fraction = 0.9964

Answer:
Log Removal = A) 1.0 - 0.9964 = 0.0036
= B) (-) x (Log 0.0036)
= C) (-) x (-2.44)
= D) **2.44**

Log Removal to % Removal

% Removal = A) (-) x (Log Removal) = Y
= B) 10_y = Z
= C) (-) x (Z) = -Z
= D) 1 + (-Z) = Decimal %
= E) 100 x (decimal) = %

Example:
Given: Log Removal = 2.9

Answer:
% Removal = A) (-) x (2.90) = 2.90
= B) $10^{-2.90} = \frac{(\ 1\ )}{794.3282} = 0.0013$
= C) (-) x (0.0013) = -0.0013
= D) 1 + (-0.003) = 0.9987
= **E) 100 x (0.9987) = 99.87%**