



# CT Factor Calculation Guidelines

## What is a CT Factor?

- ☐ CT factor is a value derived to ensure drinking water is disinfected effectively
- ☐ CT is the product of Disinfectant Concentration (mg/L) & Contact Time (minutes)
- ☐ Disinfection standards require a disinfectant concentration of 0.3 mg/L and a contact time of 20 minutes at the first user, or an equivalent CT of 6
- ☐ Each water system will have a unique CT, therefore it is important to know how to perform the calculation

## CT Calculation Procedure

### Step 1: Determine C (Concentration)

- ☐ Test free chlorine residual (C) at the first user on the system

### Step 2: Calculate T (Contact Time)

- ☐ Determine the contact volume (m<sup>3</sup>) in the distribution system up to the first user; include volume of transmission mains, clearwells & storage tanks after disinfection
- ☐ Determine the average daily flow (m<sup>3</sup>/h) for the community from water meter records, or use theoretical value (340 L/person/day x population serviced x 4.17 x 10<sup>-5</sup>)
- ☐ Calculate the peaking factor: 
$$\text{Peaking Factor} = 2.50 + \frac{2.18}{\sqrt{\frac{\text{Population}}{1000}}}$$
- ☐ Multiply the average daily flow and calculated peaking factor to determine the peak flow rate (m<sup>3</sup>/h)
- ☐ Use the peak flow rate and contact volume to calculate T (Contact Time)

$$\text{Contact Time (min)} = \frac{\text{Contact Volume (m}^3\text{)} * 60\left(\frac{\text{min}}{\text{h}}\right)}{\text{Peak Flow Rate}\left(\frac{\text{m}^3}{\text{h}}\right)}$$

### Step 3: Calculate CT

- ☐ Determine the Baffling Factor (BF) based on type of contact tank or transmission main (values can be found on reverse side)
- ☐ Multiply C (Concentration), T (Contact Time), and Baffling Factor (BF) to calculate the CT factor


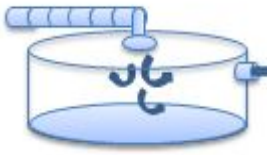
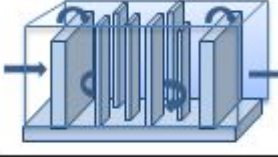

$$CT = C \times T \times BF$$

Digital tool and user's guide for calculating CT are available on our website:

[www.env.gov.nl.ca/env/waterres/waste/community](http://www.env.gov.nl.ca/env/waterres/waste/community)



## Baffling Factors

Baffling Factor	Inlet/Outlet	Intra-basin Baffles	Mixing	Notes	Schematic
0.3	Single or multiple unbaffled inlets and outlets	None	Minimal	Short circuiting and stagnation are likely to occur	
0.5	Single or multiple baffled inlets and/or outlets	Some	Moderate		
0.7	Perforated inlet baffle, outlet weir, perforated launders	Serpentine, perforated	Superior		
1	n/a	n/a	Total	Plug-flow	

## Example CT Factor Calculation

Given the following data for a water system, calculate the CT factor:

- Population serviced by water system = 1300 people
- Length of transmission main to first user = 400 m
- Diameter of transmission main to first user = 350 mm (0.35 m)
- No clearwell or storage tank

### Step 1 – Determine C (Concentration):

- ❑ Free Chlorine Residual at first user on system is 0.88 mg/L

### Step 2 – Calculate T (Contact Time):

- ❑ Contact Volume:  $\text{Volume} = 0.785D^2L = 0.785 \times 0.35\text{m} \times 0.35\text{m} \times 400\text{m} = 38.48 \text{ m}^3$
- ❑ Average Daily Flow (theoretical value):  $340 \text{ L/per/day} \times 1300 \text{ people} \times 4.17 \times 10^{-5} = 18.4 \text{ m}^3/\text{h}$
- ❑ Peaking Factor: 
$$\text{Peaking Factor} = 2.50 + \frac{2.18}{\sqrt{\frac{\text{Population}}{1000}}} = 2.50 + \frac{2.18}{\sqrt{1.3}} = 4.4$$
- ❑ Peak Flow Rate:  $\text{Average Daily Flow} \times \text{Peaking Factor} = 18.4 \text{ m}^3/\text{h} \times 4.4 = 81 \text{ m}^3/\text{h}$
- ❑ Contact Time: 
$$\text{Contact Time (min)} = \frac{\text{Contact Volume}(\text{m}^3) * 60(\frac{\text{min}}{\text{h}})}{\text{Peak Flow Rate}(\frac{\text{m}^3}{\text{h}})} = \frac{38.48(\text{m}^3) * 60(\frac{\text{min}}{\text{h}})}{81(\frac{\text{m}^3}{\text{h}})} = 28.5 \text{ min}$$

### Step 3: Calculate CT:

- ❑ Baffling Factor: Plug flow transmission main BF = 1
- ❑ Calculate CT:  $\text{CT} = \text{C} \times \text{T} \times \text{BF} = 0.88 \text{ mg/L} \times 28.5 \text{ minutes} \times 1 = 25$

**CT = 25**