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 (m³) in the distribution system up to the first user; include volume of transmission mains, clearwells & storage tanks after disinfection
- Determine the average daily flow (m³/h) for the community from water meter records, or use theoretical value (340 L/person/day x population serviced x 4.17 x 10⁻⁵)
- Calculate the peaking factor:
  \[
  \text{Peaking Factor} = 2.50 + \frac{2.18}{\sqrt{\text{Population}}}
  \]
- Multiply the average daily flow and calculated peaking factor to determine the peak flow rate (m³/h)
- Use the peak flow rate and contact volume to calculate T (Contact Time)
  \[
  \text{Contact Time (min)} = \frac{\text{Contact Volume (m³) } \times 60 \text{ (min/h)}}{\text{Peak Flow Rate (m³/h)}}
  \]

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
  \[
  \text{CT} = C \times T \times BF
  \]

Digital tool and user’s guide for calculating CT are available on our website:
www.env.gov.nl.ca/env/waterres/waste/community
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: Volume = 0.785D²L = 0.785 x 0.35m x 0.35m x 400m = 38.48 m³
- Average Daily Flow (theoretical value): 340 L/per/day x 1300 people x 4.17 x 10⁻⁵ = 18.4 m³/h
- Peaking Factor: Peaking Factor = 2.50 + \( \frac{2.10}{\sqrt{\frac{\text{Population}}{1000}}} \) = 2.50 + \( \frac{2.10}{\sqrt{1.3}} \) = 4.4
- Peak Flow Rate: Average Daily Flow x Peaking Factor = 18.4 m³/h x 4.4 = 81 m³/h
- Contact Time: Contact Time (min) = \( \frac{\text{Contact Volume} (\text{m}^3) \times 60 \text{ min}}{\text{Peak Flow Rate} (\text{m}^3/\text{h})} \) = \( \frac{38.48 (\text{m}^3) \times 60 (\text{min})}{81 (\text{m}^3/\text{h})} \) = 28.5 min

Step 3: Calculate CT:
- Baffling Factor: Plug flow transmission main BF = 1
- Calculate CT: CT = C x T x BF = 0.88 mg/L x 28.5 minutes x 1 = 25

\[ \text{CT} = 25 \]