

Disinfection Compliance Calculator Spreadsheet User Guide

The disinfection compliance calculator spreadsheet includes four separate tabs. The first is a CT-based calculator that can be used to determine whether a community is in compliance with existing CT-based disinfection requirements. The second is a similar calculator that can be used to calculate compliance with log reduction based disinfection requirements. The effective contact volume tab can be used to determine the total amount of volume available for chlorine contact. The results obtained on this tab can be then be used in the compliance calculators. The final tab contains a table that can be used to choose an appropriate baffling factor to describe the mixing characteristics of the chlorine contact volume. The spreadsheet also contains a conversion table that can be used to convert from Imperial and US units to metric units. This last is located on the effective contact time tab.

Inputs

Throughout most of the spreadsheet input cells are indicated in white while output cells are dark blue. The calculators are designed to accept three types of inputs:

- General defaults;
- Department of Environment and Conservation (ENVC) requirements; and
- User inputs.

The calculators use the values entered in these sections to compute the average day and peak hour flow, peaking factor, contact time, CT required, and CT achieved. The individual sections can be password protected such that the calculator can be distributed to staff at different levels.

General Defaults

General default values will be chosen and entered by the ENVC prior to the calculator being provided to field staff and/or system operators.

The default variables are summarized in Table H.1.

Table H.1 Default values used in the Disinfection Compliance Calculator Spreadsheet

Variable	Calculator(s)	Current Default	Source
Per capita water use	LR and CT based disinfection compliance calculators	340 Lpcd	Guidelines for the Design, Construction and Operation of Water and Sewerage Systems (2005)
Required log reduction of viruses	LR based disinfection compliance calculator	4-log	Guidelines for Canadian Drinking Water Quality (2010)
Required log reduction of <i>Giardia</i>	LR based disinfection compliance calculator	3-log	Guidelines for Canadian Drinking Water Quality (2010)
CT required in NL	CT based disinfection compliance calculator	6	Bacteriological Quality of Drinking Water (2008)

ENVC Inputs

Variables such as population, known water use and flow rates, the amount of pathogen reduction achieved before chlorine application, and the volume available for chlorine contact are community specific and unlikely to change (quickly) over time. The user can enter whatever information is available for a given community into the 'ENVC Inputs' section in each of the compliance calculators. If some information is missing, the calculators will default to the values described in Table H.1. If the effective chlorine contact volume is unknown it can be calculated using the 'Effective Chlorine Contact Volume Calculator'.

Once all available information has been input into the calculators, they will provide the following outputs:

CT based calculator:

- Average day flow (L/day);
- Peaking factor;
- Peak flow (L/min); and
- Effective contact time.

Log reduction based calculator:

- Log inactivation required from chlorination (*Giardia* and viruses);
- Average day flow;
- Peaking factor;
- Peak flow; and
- Effective contact time.

Contact Volume Calculator

The effective chlorine contact volume can be calculated using the third tab of the spreadsheet. The user must enter the dimensions of the system components where chlorine contact is occurring. This may include the transmission main between the point of chlorination and the first user, a chlorine reaction tank within the water treatment plant, a clearwell storage within the water treatment plant, or a storage volume separate from the water treatment plant/disinfection system. Once the dimensions of each component are entered, the system component calculators will determine their volumes. Not every community will have all of these components. In locations where one to three of them are missing, the input fields in the individual system component calculators can be left empty.

In order to calculate the effective contact volume all system components except the transmission main must be assigned a baffling factor to account for the level of mixing within the chlorine contact volume. An appropriate baffling factor can be chosen by comparing the characteristics of the contact volume with the tank configurations described in the table in the 'Baffling Factor' tab of the spreadsheet. The transmission main does not require a baffling factor because it is assumed that it approximates the characteristics of a 'plug-flow' reactor, which has a baffling factor of 1.

Once an appropriate baffling factor has been entered into the individual component calculators, each will calculate an effective contact volume. This will appear in the 'Total Effective Contact Volume' calculator at the top of the page along with the effective contact volumes calculated for all of the other system components. This calculator will sum the individual volumes to determine the total effective volume available for chlorine contact, which can then be input into the disinfection compliance calculators.

If the individual system component calculators are insufficient to describe the chlorine contact volume in a community, the actual and/or additional contact volume can be added to the 'other' field on the 'Total Effective Contact Volume' calculator.

Operator Inputs

Once all of the community-specific information described in the previous section has been input into the compliance calculators the actual day to day compliance of the system can be evaluated by inputting the temperature and pH of the water as well as the chlorine residual at the end of the total chlorine contact volume. Once these have been input, the calculator will provide a number of outputs including:

CT based calculator:

- CT achieved;
- Inactivation ratio;
- Log inactivation of *Giardia*;
- Log inactivation of viruses; and
- Compliance with ENVC disinfection requirements (yes or no).

Log reduction based calculator:

- CT required (*Giardia* and viruses);
- CT achieved; and
- Inactivation ratio (*Giardia* and viruses).

Operator Instructions

1. Measure the pH, temperature, and chlorine residual at the end of your chlorine contact volume (this may be at the first users tap).
2. Input these values into the appropriate fields of the disinfection compliance calculator.
3. The calculator will indicate whether you are currently in or out of compliance with ENVC disinfection requirements.