



CT Determination for Filtered Systems

I

I. PWS INFORMATION:

PWSID#: PWS Name: Hinsdale PWS Town:

Treatment Plant Name: Reporting Period → Month: Year:

Disinfectant¹: Sequence of Application: 1st 2nd 3rd 4th 5 6th

II. DAILY REPORTING: All measurements taken during peak hourly flow.

Day	Peak Hourly Flow ² (gpm)	Disinfectant Concentration ³ C (mg/L)	Disinfectant Contact Time ⁴ T (min.)	CT calc (= C x T)	pH ⁵	Water Temp ⁶ (°C)	CT ⁷ 99.9	Inactivation Ratio ⁸ (CT calc / CT 99.9)	Inactivation Ratio ⁹ < 1.0
1									<input type="checkbox"/> Yes
2									<input type="checkbox"/> Yes
3									<input type="checkbox"/> Yes
4									<input type="checkbox"/> Yes
5		↑		↑	↑	↑	↑	↑	<input type="checkbox"/> Yes
6		↑	↑	↑	↑	↑	↑	↑	<input type="checkbox"/> Yes
7		(3)	(5)	(6)	(1)	(9)	(4)	(7)	<input type="checkbox"/> Yes
8									<input type="checkbox"/> Yes

SEE EXAMPLE DO NEXT PAGE

Steps to Calculate CT

- ① Record the pH of the disinfected water
- ② Record the Temp of the disinfected water
- ③ Record the free chlorine residual at time of peak hourly flow
- ④ Use EPA "CT Table" to look up the required "CT" for the given pH, Temp and free Chlorine Residual and record this number in column ④
- ⑤ In order to calculate the actual "CT" you must know both the "peak hourly flow" and the level of water in the tank at the time of peak hourly flow.

(a) Peak hourly flow is the highest volume of water that went out to the distribution system in a 1 hour period of time. For example if 3000 gal of water went out to the system between 6 and 7 pm then the peak hourly flow would be: $\frac{3,000 \text{ gal}}{60 \text{ min}} = 50 \text{ gal/min}$

(b) The Hinsdale tank (530,000 gal) has 22,083 gal/A of water

To find out volume of water in tank at peak hourly flow: $[\text{A of water in tank}] \times [22,083 \text{ gal/A}] \times [0.10]$

(c) Contact Time = $\frac{\text{Tank Volume from (b) above}}{\text{Peak flow from (a) above}}$

since no tracer study can only use 10% of water volume in tank

- ⑥ "CT Calc" = $[\text{Answer from (c) above}] \times [\text{Free Chlorine Residual from step ③ above}]$
- ⑦ Divide step ⑥ above by step ④ above and hopefully the answer is above 1.0. If not check off "yes" and call MassDEP ASAP.



I. PWS INFORMATION:

PWSID#: PWS Name: Hinsdale PWS Town:
 Treatment Plant Name: Reporting Period → Month: Year:
 Disinfectant¹: Sequence of Application: 1st 2nd 3rd 4th 5 6th

II. DAILY REPORTING: All measurements taken during peak hourly flow.

Day	Peak Hourly Flow ² (gpm)	Disinfectant Concentration ³ C (mg/L)	Disinfectant Contact Time ⁴ T (min.)	CT calc (= C x T)	pH ⁵	Water Temp ⁶ (°C)	CT ⁷ 99.9	Inactivation Ratio ⁸ (CT calc / CT 99.9)	Inactivation Ratio ⁹ < 1.0
1	50	0.8	883	706	7.2	8	46.1	15	<input type="checkbox"/> Yes
2		↑	↑	↑	↑	↑	↑	↑	<input type="checkbox"/> Yes
3		③	⑤	⑥	①	②	④	⑦	<input type="checkbox"/> Yes
4									<input type="checkbox"/> Yes
5									<input type="checkbox"/> Yes
6	EXAMPLE CALCULATION								<input type="checkbox"/> Yes
7									<input type="checkbox"/> Yes
8									<input type="checkbox"/> Yes

Assume the following:
 pH of disinfected water is 7.2
 Temp of disinfected water is 48°F = 8°C
 Peak hourly flow = 50 gpm
 Free chlorine residual at peak hourly flow = 0.8 mg/L
 Water level in tank at peak hourly flow = 20 ft

Steps to Calculate CT:

- ① pH = 7.2
- ② Temp = 8°C
- ③ Free Chlorine Residual at peak hourly flow = 0.8 mg/L
- ④ Use EPA "CT Table" (attached) for pH = 7.2, Temp = 8°C, C₂ = 0.8 and "CT_{99.9}" = **46.1**
- ⑤ Volume of water in tank at peak hourly flow:
 (a) $[20 \text{ ft}] \times [22,083 \text{ gal/ft}] \times [0.10] = 44,166 \text{ gal}$
 Contact Time = $\frac{\text{Tank Volume (a) above}}{\text{Peak hourly flow}} = \frac{44,166 \text{ gal}}{50 \text{ gpm}} = \mathbf{883 \text{ min}}$
- ⑥ "CT Calc" = [Answer from ⑤ above] × [Free Chlorine Residual from ③ above]
 = 883 min × 0.8 mg/L = 706 min · mg/L
- ⑦ Inactivation Ratio = $\frac{706}{46.1} = 15$

15 is > 1.0 so easily meets the required CT.

Required CT Valued for 1 log Inactivation of Giardia by Free Chlorine

TEMP=0.5 (33F)

CL2	pH																			
	6	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0	7.1	7.2	7.3	7.4	7.5	7.7	7.8	7.9	8
0.20	46.4	48.1	49.8	51.6	53.5	55.4	57.5	59.6	61.8	64.1	66.4	68.9	71.5	74.1	76.9	79.8	85.9	89.1	92.5	96.0
0.40	47.5	49.2	51.0	52.8	54.7	56.7	58.8	61.0	63.2	65.6	68.0	70.5	73.2	75.9	78.7	81.7	88.0	91.3	94.7	98.3
0.60	48.5	50.3	52.1	54.0	56.0	58.1	60.2	62.4	64.7	67.1	69.6	72.2	74.9	77.7	80.6	83.7	90.1	93.5	97.0	100.7
0.80	49.7	51.5	53.3	55.3	57.3	59.4	61.6	63.9	66.3	68.7	71.3	73.9	76.7	79.6	82.6	85.7	92.3	95.7	99.4	103.1
1.00	50.8	52.7	54.6	56.6	58.7	60.8	63.1	65.4	67.8	70.3	73.0	75.7	78.5	81.5	84.5	87.7	94.5	98.1	101.8	105.7
1.20	52.0	53.9	55.9	57.9	60.0	62.3	64.6	66.9	69.4	72.0	74.7	77.5	80.4	83.4	86.6	89.8	96.8	100.4	104.3	108.2
1.40	53.2	55.2	57.2	59.3	61.5	63.7	66.1	68.5	71.1	73.7	76.5	79.4	82.3	85.4	88.7	92.0	99.1	102.9	106.8	110.9
1.60	54.4	56.4	58.5	60.7	62.9	65.2	67.6	70.2	72.8	75.5	78.3	81.3	84.3	87.5	90.8	94.2	101.5	105.4	109.4	113.6
1.80	55.7	57.8	59.9	62.1	64.4	66.8	69.3	71.8	74.5	77.3	80.2	83.2	86.3	89.6	93.0	96.5	104.0	107.9	112.0	116.3
2.00	57.0	59.1	61.3	63.6	65.9	68.4	70.9	73.5	76.3	79.2	82.1	85.2	88.4	91.8	95.2	98.8	106.5	110.6	114.8	119.2

TEMP=2.0 (36F)

CL2	pH																			
	6	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0	7.1	7.2	7.3	7.4	7.5	7.7	7.8	7.9	8
0.20	42.0	43.5	45.1	46.7	48.4	50.1	51.9	53.8	55.8	57.9	60.0	62.2	64.5	66.9	69.4	71.9	77.4	80.3	83.3	86.5
0.40	43.0	44.5	46.1	47.8	49.5	51.3	53.2	55.1	57.1	59.2	61.4	63.7	66.0	68.5	71.0	73.7	79.3	82.3	85.3	88.6
0.60	44.0	45.5	47.2	48.9	50.6	52.5	54.4	56.4	58.5	60.6	62.8	65.2	67.6	70.1	72.7	75.4	81.2	84.2	87.4	90.7
0.80	45.0	46.6	48.3	50.0	51.8	53.7	55.7	57.7	59.8	62.0	64.3	66.7	69.2	71.8	74.4	77.2	83.1	86.3	89.5	92.9
1.00	46.0	47.6	49.4	51.2	53.0	55.0	57.0	59.1	61.2	63.5	65.8	68.3	70.8	73.5	76.2	79.1	85.1	88.3	91.7	95.1
1.20	47.0	48.7	50.5	52.3	54.3	56.2	58.3	60.4	62.7	65.0	67.4	69.9	72.5	75.2	78.0	81.0	87.2	90.5	93.9	97.4
1.40	48.1	49.9	51.7	53.6	55.5	57.6	59.7	61.9	64.2	66.5	69.0	71.6	74.2	77.0	79.9	82.9	89.3	92.6	96.1	99.8
1.60	49.2	51.0	52.9	54.8	56.8	58.9	61.1	63.3	65.7	68.1	70.6	73.3	76.0	78.9	81.8	84.9	91.4	94.9	98.5	102.2
1.80	50.4	52.2	54.1	56.1	58.1	60.3	62.5	64.8	67.2	69.7	72.3	75.0	77.8	80.7	83.8	86.9	93.6	97.2	100.9	104.7
2.00	51.5	53.4	55.4	57.4	59.5	61.7	64.0	66.4	68.8	71.4	74.0	76.8	79.7	82.7	85.8	89.0	95.9	99.5	103.3	107.2

Required CT Valued for 1 log Inactivation of Giardia by Free Chlorine

TEMP= 4.0 (39F)

Cl2	pH																				
	6	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8
0.20	36.9	38.2	39.5	40.9	42.4	43.9	45.5	47.1	48.8	50.6	52.4	54.3	56.3	58.4	60.5	62.7	65.1	67.5	70.0	72.6	75.3
0.40	37.7	39.0	40.4	41.9	43.3	44.9	46.5	48.2	49.9	51.7	53.6	55.6	57.6	59.7	61.9	64.2	66.6	69.1	71.7	74.3	77.1
0.60	38.6	39.9	41.3	42.8	44.3	45.9	47.6	49.3	51.1	52.9	54.9	56.9	59.0	61.1	63.4	65.7	68.2	70.7	73.4	76.1	79.0
0.80	39.4	40.8	42.3	43.8	45.4	47.0	48.7	50.4	52.3	54.2	56.2	58.2	60.4	62.6	64.9	67.3	69.8	72.4	75.1	77.9	80.8
1.00	40.3	41.7	43.2	44.8	46.4	48.1	49.8	51.6	53.5	55.4	57.5	59.6	61.8	64.1	66.4	68.9	71.5	74.1	76.9	79.8	82.8
1.20	41.2	42.7	44.2	45.8	47.5	49.2	51.0	52.8	54.7	56.7	58.8	61.0	63.2	65.6	68.0	70.5	73.2	75.9	78.7	81.7	84.8
1.40	42.2	43.7	45.2	46.9	48.6	50.3	52.1	54.0	56.0	58.1	60.2	62.4	64.7	67.1	69.6	72.2	74.9	77.7	80.6	83.7	86.8
1.60	43.1	44.7	46.3	47.9	49.7	51.5	53.4	55.3	57.3	59.4	61.6	63.9	66.3	68.7	71.3	73.9	76.7	79.6	82.6	85.7	88.9
1.80	44.1	45.7	47.3	49.0	50.8	52.7	54.6	56.6	58.7	60.8	63.1	65.4	67.8	70.4	73.0	75.7	78.5	81.5	84.5	87.7	91.0
2.00	45.1	46.7	48.4	50.2	52.0	53.9	55.9	57.9	60.0	62.3	64.6	67.0	69.4	72.0	74.7	77.5	80.4	83.4	86.6	89.8	93.2

TEMP= 6.0 (43F)

Cl2	pH																				
	6	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8
0.20	32.4	33.6	34.7	35.9	37.2	38.5	39.9	41.3	42.7	44.3	45.9	47.5	49.2	51.0	52.9	54.8	56.8	58.9	61.1	63.3	65.7
0.40	33.2	34.3	35.5	36.7	38.0	39.4	40.8	42.2	43.7	45.3	46.9	48.6	50.4	52.2	54.1	56.1	58.1	60.3	62.5	64.8	67.2
0.60	33.9	35.1	36.3	37.6	38.9	40.3	41.7	43.2	44.7	46.3	48.0	49.7	51.5	53.4	55.4	57.4	59.5	61.7	64.0	66.3	68.8
0.80	34.6	35.9	37.1	38.4	39.8	41.2	42.6	44.2	45.7	47.4	49.1	50.9	52.7	54.7	56.7	58.7	60.9	63.1	65.5	67.9	70.4
1.00	35.4	36.7	37.9	39.3	40.7	42.1	43.6	45.2	46.8	48.5	50.2	52.1	54.0	55.9	58.0	60.1	62.3	64.6	67.0	69.5	72.1
1.20	36.2	37.5	38.8	40.2	41.6	43.1	44.6	46.2	47.9	49.6	51.4	53.3	55.2	57.2	59.3	61.5	63.8	66.2	68.6	71.2	73.8
1.40	37.0	38.3	39.7	41.1	42.5	44.1	45.6	47.3	49.0	50.8	52.6	54.5	56.5	58.6	60.7	63.0	65.3	67.7	70.3	72.9	75.6
1.60	37.8	39.2	40.6	42.0	43.5	45.1	46.7	48.4	50.1	51.9	53.8	55.8	57.8	60.0	62.2	64.5	66.9	69.3	71.9	74.6	77.4
1.80	38.7	40.1	41.5	43.0	44.5	46.1	47.8	49.5	51.3	53.1	55.1	57.1	59.2	61.4	63.6	66.0	68.4	71.0	73.6	76.4	79.3
2.00	39.6	41.0	42.4	43.9	45.5	47.2	48.9	50.6	52.5	54.4	56.4	58.4	60.6	62.8	65.1	67.6	70.1	72.7	75.4	78.2	81.2

Required CT Valued for 1 log Inactivation of Giardia by Free Chlorine

TEMP= 8.0 (46F)

Cl ₂	pH																				
	6	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8
0.20	28.6	29.6	30.6	31.6	32.7	33.9	35.0	36.2	37.5	38.8	40.2	41.6	43.1	44.7	46.3	47.9	49.7	51.5	53.3	55.3	57.3
0.40	29.2	30.2	31.3	32.3	33.4	34.6	35.8	37.1	38.4	39.7	41.1	42.6	44.1	45.7	47.3	49.0	50.8	52.7	54.6	56.6	58.7
0.60	29.9	30.9	31.9	33.0	34.2	35.4	36.6	37.9	39.2	40.6	42.1	43.6	45.1	46.7	48.4	50.2	52.0	53.9	55.9	57.9	60.0
0.80	30.5	31.6	32.6	33.8	34.9	36.2	37.4	38.7	40.1	41.5	43.0	44.5	46.1	47.8	49.5	51.3	53.2	55.1	57.2	59.3	61.4
1.00	31.2	32.2	33.4	34.5	35.7	37.0	38.3	39.6	41.0	42.5	44.0	45.6	47.2	48.9	50.7	52.5	54.4	56.4	58.5	60.7	62.9
1.20	31.9	33.0	34.1	35.3	36.5	37.8	39.1	40.5	41.9	43.4	45.0	46.6	48.3	50.0	51.9	53.8	55.7	57.8	59.9	62.1	64.4
1.40	32.6	33.7	34.9	36.1	37.3	38.6	40.0	41.4	42.9	44.4	46.0	47.7	49.4	51.2	53.1	55.0	57.0	59.1	61.3	63.6	65.9
1.60	33.3	34.4	35.6	36.9	38.2	39.5	40.9	42.4	43.9	45.5	47.1	48.8	50.6	52.4	54.3	56.3	58.4	60.5	62.7	65.1	67.5
1.80	34.0	35.2	36.4	37.7	39.0	40.4	41.8	43.3	44.9	46.5	48.2	49.9	51.7	53.6	55.6	57.6	59.7	61.9	64.2	66.6	69.1
2.00	34.8	36.0	37.2	38.5	39.9	41.3	42.8	44.3	45.9	47.6	49.3	51.1	52.9	54.9	56.9	59.0	61.1	63.4	65.7	68.2	70.7

TEMP= 10.0 (50F)

Cl ₂	pH																				
	6	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8
0.20	25.3	26.1	27.0	27.9	28.9	29.8	30.8	31.9	33.0	34.1	35.3	36.6	37.8	39.2	40.6	42.0	43.5	45.1	46.7	48.4	50.1
0.40	25.8	26.7	27.6	28.5	29.5	30.5	31.5	32.6	33.7	34.9	36.1	37.4	38.7	40.1	41.5	43.0	44.5	46.1	47.7	49.5	51.3
0.60	26.4	27.3	28.2	29.1	30.1	31.1	32.2	33.3	34.5	35.7	36.9	38.2	39.6	41.0	42.4	43.9	45.5	47.1	48.8	50.6	52.5
0.80	26.9	27.8	28.8	29.8	30.8	31.8	32.9	34.1	35.2	36.5	37.7	39.1	40.5	41.9	43.4	44.9	46.6	48.2	50.0	51.8	53.7
1.00	27.5	28.4	29.4	30.4	31.4	32.5	33.6	34.8	36.0	37.3	38.6	40.0	41.4	42.8	44.4	46.0	47.6	49.3	51.1	53.0	54.9
1.20	28.1	29.1	30.0	31.1	32.1	33.2	34.4	35.6	36.8	38.1	39.5	40.9	42.3	43.8	45.4	47.0	48.7	50.5	52.3	54.2	56.2
1.40	28.7	29.7	30.7	31.7	32.8	34.0	35.1	36.4	37.7	39.0	40.4	41.8	43.3	44.8	46.4	48.1	49.8	51.7	53.5	55.5	57.5
1.60	29.3	30.3	31.4	32.4	33.6	34.7	35.9	37.2	38.5	39.9	41.3	42.7	44.3	45.9	47.5	49.2	51.0	52.9	54.8	56.8	58.9
1.80	30.0	31.0	32.1	33.2	34.3	35.5	36.7	38.0	39.4	40.8	42.2	43.7	45.3	46.9	48.6	50.4	52.2	54.1	56.1	58.1	60.3
2.00	30.6	31.7	32.8	33.9	35.1	36.3	37.6	38.9	40.3	41.7	43.2	44.7	46.3	48.0	49.7	51.5	53.4	55.3	57.4	59.5	61.7

Required CT Valued for 1 log Inactivation of Giardia by Free Chlorine

TEMP= 12.0 (54F)

Cl2	pH																				
	6	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8
0.20	20.9	21.7	22.6	23.4	24.3	25.2	26.2	27.2	28.2	29.3	30.4	31.5	32.7	33.9	35.6	36.6	37.9	39.3	40.8	42.4	43.9
0.40	21.4	22.2	23.1	24.0	24.9	25.8	26.8	27.8	28.9	30.0	31.1	32.3	33.5	34.7	36.4	37.4	38.8	40.3	41.8	43.3	44.9
0.60	21.9	22.8	23.6	24.5	25.4	26.4	27.4	28.4	29.5	30.6	31.8	33.0	34.2	35.5	37.3	38.2	39.7	41.2	42.7	44.3	46.0
0.80	22.4	23.3	24.2	25.1	26.0	27.0	28.0	29.1	30.2	31.3	32.5	33.8	35.0	36.3	38.1	39.1	40.6	42.1	43.7	45.3	47.0
1.00	22.9	23.8	24.7	25.7	26.6	27.6	28.7	29.8	30.9	32.1	33.3	34.5	35.8	37.2	39.0	40.0	41.5	43.1	44.7	46.4	48.1
1.20	23.5	24.4	25.3	26.3	27.3	28.3	29.4	30.5	31.6	32.8	34.0	35.3	36.7	38.0	39.9	40.9	42.5	44.1	45.7	47.4	49.2
1.40	24.0	24.9	25.9	26.9	27.9	28.9	30.0	31.2	32.3	33.6	34.8	36.1	37.5	38.9	40.8	41.9	43.4	45.1	46.8	48.5	50.3
1.60	24.6	25.5	26.5	27.5	28.5	29.6	30.7	31.9	33.1	34.3	35.6	37.0	38.4	39.8	41.7	42.8	44.4	46.1	47.8	49.6	51.5
1.80	25.2	26.1	27.1	28.1	29.2	30.3	31.4	32.6	33.8	35.1	36.4	37.8	39.2	40.7	42.7	43.8	45.5	47.2	48.9	50.7	52.6
2.00	25.7	26.7	27.7	28.8	29.9	31.0	32.2	33.4	34.6	35.9	37.3	38.7	40.1	41.6	43.7	44.8	46.5	48.2	50.0	51.9	53.8

TEMP= 14.0 (57F)

Cl2	pH																				
	6	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8
0.20	18.3	19.0	19.7	20.5	21.2	22.1	22.9	23.8	24.7	25.6	26.6	27.6	28.6	29.7	30.8	32.0	33.2	34.5	35.7	37.1	38.5
0.40	18.7	19.4	20.2	20.9	21.7	22.6	23.4	24.3	25.2	26.2	27.2	28.2	29.3	30.4	31.5	32.7	34.0	35.2	36.6	37.9	39.4
0.60	19.1	19.9	20.6	21.4	22.2	23.1	24.0	24.9	25.8	26.8	27.8	28.9	30.0	31.1	32.3	33.5	34.7	36.1	37.4	38.8	40.3
0.80	19.6	20.3	21.1	21.9	22.8	23.6	24.5	25.5	26.4	27.4	28.5	29.5	30.7	31.8	33.0	34.3	35.5	36.9	38.3	39.7	41.2
1.00	20.0	20.8	21.6	22.4	23.3	24.2	25.1	26.0	27.0	28.1	29.1	30.2	31.4	32.5	33.8	35.0	36.4	37.7	39.1	40.6	42.1
1.20	20.5	21.3	22.1	23.0	23.8	24.7	25.7	26.7	27.7	28.7	29.8	30.9	32.1	33.3	34.5	35.8	37.2	38.6	40.0	41.5	43.1
1.40	21.0	21.8	22.6	23.5	24.4	25.3	26.3	27.3	28.3	29.4	30.5	31.6	32.8	34.1	35.3	36.7	38.0	39.5	41.0	42.5	44.1
1.60	21.5	22.3	23.2	24.0	25.0	25.9	26.9	27.9	29.0	30.0	31.2	32.4	33.6	34.8	36.2	37.5	38.9	40.4	41.9	43.5	45.1
1.80	22.0	22.8	23.7	24.6	25.5	26.5	27.5	28.5	29.6	30.7	31.9	33.1	34.4	35.6	37.0	38.4	39.8	41.3	42.9	44.5	46.1
2.00	22.5	23.4	24.2	25.2	26.1	27.1	28.1	29.2	30.3	31.5	32.6	33.9	35.1	36.5	37.8	39.3	40.7	42.3	43.8	45.5	47.2