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Important Formulas of Design of Continuous Flow Type of Sedimentation Tank

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List of 22 Important Formulas of Design of Continuous Flow Type of Sedimentation Tank

Important Formulas of Design of Continuous Flow Type of Sedimentation Tank

1) Cross-section Area of Tank with known Velocity of Flow of Water

$$\text{fx } A_{cs} = \frac{Q}{V_w}$$

Open Calculator 

$$\text{ex } 0.3\text{m}^2 = \frac{3.0\text{m}^3/\text{s}}{10\text{m}/\text{s}}$$

2) Depth of Tank given Detention Time

$$\text{fx } d = \frac{T_d \cdot Q}{L \cdot w}$$

Open Calculator 

$$\text{ex } 3.00309\text{m} = \frac{6.9\text{s} \cdot 3.0\text{m}^3/\text{s}}{3.01\text{m} \cdot 2.29\text{m}}$$

3) Depth of Tank given Flow Velocity

$$\text{fx } d = \left(\frac{Q_d}{V_f \cdot w} \right)$$

Open Calculator 

$$\text{ex } 3.19713\text{m} = \left(\frac{8.2\text{m}^3/\text{s}}{1.12\text{m}/\text{s} \cdot 2.29\text{m}} \right)$$



4) Detention Time for Circular Tank

$$fx \quad T_d = \left((D)^2 \right) \cdot \left(\frac{(0.011 \cdot D) + (0.785 \cdot d)}{Q_d} \right)$$

[Open Calculator !\[\]\(cbe80b694ebd74fcfe136a095b608235_img.jpg\)](#)

$$ex \quad 6.765331s = \left((4.8m)^2 \right) \cdot \left(\frac{(0.011 \cdot 4.8m) + (0.785 \cdot 3.00m)}{8.2m^3/s} \right)$$

5) Detention Time for Rectangular Tank

$$fx \quad T_d = \frac{V}{Q_d}$$

[Open Calculator !\[\]\(3e2231b1ad3ca8da8658228c00dd08e0_img.jpg\)](#)

$$ex \quad 6.826829s = \frac{55.98m^3}{8.2m^3/s}$$

6) Detention Time given Discharge

$$fx \quad T_d = \left(\frac{w \cdot L \cdot d}{Q} \right)$$

[Open Calculator !\[\]\(0d5ec72f61334709c3fc9450209b754f_img.jpg\)](#)

$$ex \quad 6.8929s = \left(\frac{2.29m \cdot 3.01m \cdot 3.00m}{3.0m^3/s} \right)$$

7) Discharge Entering Basin given Flow Velocity

$$fx \quad Q_v = (V_f \cdot w \cdot d)$$

[Open Calculator !\[\]\(b64b40baaee5acddc1eab8538ba84754_img.jpg\)](#)

$$ex \quad 7.6944m^3/s = (1.12m/s \cdot 2.29m \cdot 3.00m)$$



8) Discharge given Detention Time for Circular Tank

[Open Calculator !\[\]\(dfbd6b3763a6d1d9afaa974f64e2e4b5_img.jpg\)](#)

$$fx \quad Q_d = \left((D)^2 \right) \cdot \left(\frac{(0.011 \cdot D) + (0.785 \cdot d)}{T_d} \right)$$

$$ex \quad 8.039958m^3/s = \left((4.8m)^2 \right) \cdot \left(\frac{(0.011 \cdot 4.8m) + (0.785 \cdot 3.00m)}{6.9s} \right)$$

9) Discharge given Detention Time for Rectangular Tank

[Open Calculator !\[\]\(ec9132f1d27c8919987d92907322654d_img.jpg\)](#)

$$fx \quad Q = \left(\frac{w \cdot L \cdot d}{T_d} \right)$$

$$ex \quad 2.996913m^3/s = \left(\frac{2.29m \cdot 3.01m \cdot 3.00m}{6.9s} \right)$$

10) Flow Velocity given Length of Tank

[Open Calculator !\[\]\(758ebdf4629c903da74c2e079717ae32_img.jpg\)](#)

$$fx \quad V_f = \left(\frac{v_s \cdot L}{d} \right)$$

$$ex \quad 1.505m/s = \left(\frac{1.5m/s \cdot 3.01m}{3.00m} \right)$$

11) Flow Velocity of Water Entering Tank

[Open Calculator !\[\]\(248b91fcdac4810ffd15cf33fb6aec6f_img.jpg\)](#)

$$fx \quad v_w = \left(\frac{Q}{w \cdot D_t} \right)$$

$$ex \quad 0.262009m/s = \left(\frac{3.0m^3/s}{2.29m \cdot 5m} \right)$$



12) Height of Tank given Flow Velocity

[Open Calculator !\[\]\(bd1a142de767a21e5362c595f844a4ff_img.jpg\)](#)

$$fx \quad d = \frac{L \cdot v_s}{V_f}$$

$$ex \quad 4.03125m = \frac{3.01m \cdot 1.5m/s}{1.12m/s}$$

13) Length of Tank given Overflow Rate

[Open Calculator !\[\]\(830769b31eeeaca920791081939ff8ba_img.jpg\)](#)

$$fx \quad L = \left(\frac{Q}{SOR \cdot w} \right)$$

$$ex \quad 3.010211m = \left(\frac{3.0m^3/s}{0.4352m/s \cdot 2.29m} \right)$$

14) Length of Tank given Settling Velocity

[Open Calculator !\[\]\(47734e4656765d20df4fdbd5b7aff048_img.jpg\)](#)

$$fx \quad l_t = \left(\frac{Q}{v_s \cdot w} \right)$$

$$ex \quad 0.873362m = \left(\frac{3.0m^3/s}{1.5m/s \cdot 2.29m} \right)$$

15) Overflow Rate given Discharge

[Open Calculator !\[\]\(41aea2746216b27a6939d696d8e035da_img.jpg\)](#)

$$fx \quad SOR = \frac{Q}{w \cdot L}$$

$$ex \quad 0.43523m/s = \frac{3.0m^3/s}{2.29m \cdot 3.01m}$$



16) Plan Area given Settling Velocity

$$fx \quad SA_{Base} = \frac{Q}{v_s}$$

Open Calculator 

$$ex \quad 2m^2 = \frac{3.0m^3/s}{1.5m/s}$$

17) Rate of Flow given Detention Time

$$fx \quad q_{flow} = \left(\frac{V}{T_d} \right)$$

Open Calculator 

$$ex \quad 8.113043m^3/s = \left(\frac{55.98m^3}{6.9s} \right)$$

18) Settling Velocity of Particular Sized Particle

$$fx \quad v_s = \frac{70 \cdot Q_s}{100 \cdot w \cdot L}$$

Open Calculator 

$$ex \quad 1.049964m/s = \frac{70 \cdot 10.339m^3/s}{100 \cdot 2.29m \cdot 3.01m}$$

19) Volume of Tank given Detention Time

$$fx \quad V = T_d \cdot q_{flow}$$

Open Calculator 

$$ex \quad 55.959m^3 = 6.9s \cdot 8.11m^3/s$$



20) Width of Tank given Height to Length Ratio

[Open Calculator !\[\]\(feabb98897b440bc8695a03336a6e2df_img.jpg\)](#)

$$fx \quad w = \left(\frac{Q}{v_s \cdot d} \right) \cdot (HL)$$

$$ex \quad 2.3m = \left(\frac{3.0m^3/s}{1.5m/s \cdot 3.00m} \right) \cdot (3.45)$$

21) Width of Tank given Overflow Rate

[Open Calculator !\[\]\(642aa997563f9a325b310230bb5078b7_img.jpg\)](#)

$$fx \quad w = \left(\frac{Q}{SOR \cdot L} \right)$$

$$ex \quad 2.29016m = \left(\frac{3.0m^3/s}{0.4352m/s \cdot 3.01m} \right)$$

22) Width of Tank given Settling Velocity

[Open Calculator !\[\]\(51514032c8ca341817228f39f1307b05_img.jpg\)](#)

$$fx \quad w = \left(\frac{Q_s}{v_s \cdot L} \right)$$

$$ex \quad 2.289922m = \left(\frac{10.339m^3/s}{1.5m/s \cdot 3.01m} \right)$$









Variables Used

- **A_{CS}** Cross-Sectional Area (Square Meter)
- **d** Depth (Meter)
- **D** Diameter (Meter)
- **D_t** Depth of Tank (Meter)
- **HL** Ratio of Height to Length
- **L** Length (Meter)
- **l_t** Length of Tank given Settling Velocity (Meter)
- **Q** Discharge (Cubic Meter per Second)
- **Q_d** Discharge in Tank (Cubic Meter per Second)
- **q_{flow}** Rate of Flow (Cubic Meter per Second)
- **Q_s** Discharge entering Basin given Settling Velocity (Cubic Meter per Second)
- **Q_v** Discharge entering Basin given Flow Velocity (Cubic Meter per Second)
- **SA_{Base}** Base Surface Area (Square Meter)
- **SOR** Overflow Rate (Meter per Second)
- **T_d** Detention Time (Second)
- **V** Volume of Tank (Cubic Meter)
- **V_f** Flow Velocity (Meter per Second)
- **v_s** Settling Velocity (Meter per Second)
- **v_w** Flow Velocity of Water (Meter per Second)
- **V_w** Velocity of Flow of Water (Meter per Second)
- **w** Width (Meter)



Constants, Functions, Measurements used

- **Measurement: Length** in Meter (m)
Length Unit Conversion 
- **Measurement: Time** in Second (s)
Time Unit Conversion 
- **Measurement: Volume** in Cubic Meter (m³)
Volume Unit Conversion 
- **Measurement: Area** in Square Meter (m²)
Area Unit Conversion 
- **Measurement: Speed** in Meter per Second (m/s)
Speed Unit Conversion 
- **Measurement: Volumetric Flow Rate** in Cubic Meter per Second (m³/s)
Volumetric Flow Rate Unit Conversion 



Check other formula lists

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