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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

Open Calculator

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

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

2) Depth of Tank given Detention Time

Open Calculator

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

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

Open Calculator

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

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

4) Detention Time for Circular Tank

Open Calculator

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

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

5) Detention Time for Rectangular Tank

Open Calculator

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

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

6) Detention Time given Discharge

Open Calculator

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

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

7) Discharge Entering Basin given Flow Velocity

Open Calculator

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

$$7.6944\text{m}^3/\text{s} = (1.12\text{m/s} \cdot 2.29\text{m} \cdot 3.00\text{m})$$

8) Discharge given Detention Time for Circular Tank

Open Calculator

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

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

9) Discharge given Detention Time for Rectangular Tank

Open Calculator

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

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

10) Flow Velocity given Length of Tank

Open Calculator

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

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

11) Flow Velocity of Water Entering Tank

Open Calculator

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

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

12) Height of Tank given Flow Velocity

Open Calculator

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

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

13) Length of Tank given Overflow Rate

Open Calculator

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

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

14) Length of Tank given Settling Velocity

Open Calculator

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

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

15) Overflow Rate given Discharge

Open Calculator

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

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

16) Plan Area given Settling Velocity

Open Calculator

$$\mathrm{SA_{Base}} = \frac{\mathrm{Q}}{\mathrm{v_s}}$$

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

17) Rate of Flow given Detention Time

Open Calculator

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

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

18) Settling Velocity of Particular Sized Particle

Open Calculator

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

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

19) Volume of Tank given Detention Time

Open Calculator

$$\mathrm{V} = \mathrm{T_d} \cdot \mathrm{q_{flow}}$$

$$55.959\mathrm{m^3} = 6.9\mathrm{s} \cdot 8.11\mathrm{m^3/s}$$

20) Width of Tank given Height to Length Ratio

Open Calculator

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

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

21) Width of Tank given Overflow Rate

Open Calculator

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

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

22) Width of Tank given Settling Velocity

Open Calculator

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

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

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 (m^3)
  Volume Unit Conversion
- Measurement: **Area** in Square Meter (m^2)
  Area Unit Conversion
- Measurement: **Speed** in Meter per Second (m/s)
  Speed Unit Conversion
- Measurement: **Volumetric Flow Rate** in Cubic Meter per Second (m^3/s)
  Volumetric Flow Rate Unit Conversion

Check other formula lists

- **Important Formulas of Design of Continuous Flow Type of Sedimentation Tank**

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