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Design of an Aerated Grit Chamber Formulas

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List of 16 Design of an Aerated Grit Chamber Formulas

Design of an Aerated Grit Chamber

1) Air Supply required in Grit Chamber

Open Calculator

fx $$A_s = \frac{A}{L}$$

ex $$0.007659 m^3/s = \frac{0.053 m^2/s}{6.92 m}$$

2) Assumed Grit Quantity given Volume of Grit

Open Calculator

fx $$Q_g = \frac{V_g}{V}$$

ex $$25 = \frac{500 m^3}{20}$$

3) Chamber Length using Air Supply required

Open Calculator

fx $$L = \left(\frac{A}{A_s}\right)$$

ex $$6.973684 m = \left(\frac{0.053 m^2/s}{0.0076 m^3/s}\right)$$

4) Chosen Air Supply given Air Supply required

Open Calculator

fx $A = A_s \cdot L$

ex $0.052592 m^2/s = 0.0076 m^3/s \cdot 6.92 m$

5) Chosen Depth given Width of Grit Chamber

Open Calculator

fx $D = \frac{W}{R}$

ex $2.524272 m = \frac{2.6 m}{1.03}$

6) Depth given Length of Grit Chamber

Open Calculator

fx $D = \left(\frac{V_T}{L \cdot W} \right)$

ex $2.501112 m = \left(\frac{45 m^3}{6.92 m \cdot 2.6 m} \right)$

7) Detention Time given Volume of Each Grit Chamber

Open Calculator

fx $T_d = \frac{V_T}{Q_p}$

ex $3 min = \frac{45 m^3}{0.25 m^3/s}$

8) Length of Grit Chamber

Open Calculator

$$L = \left(\frac{V_T}{W \cdot D} \right)$$

$$6.920309\text{m} = \left(\frac{45\text{m}^3}{2.6\text{m} \cdot 2.501\text{m}} \right)$$

9) Peak Flow Rate given Volume of Each Grit Chamber

Open Calculator

$$Q_p = \frac{V_T}{T_d}$$

$$0.25\text{m}^3/\text{s} = \frac{45\text{m}^3}{3\text{min}}$$

10) Selected Width-Ratio given Width of Grit Chamber

Open Calculator

$$R = \frac{W}{D}$$

$$1.039584 = \frac{2.6\text{m}}{2.501\text{m}}$$

11) Volume Flow Rate given Volume of Grit

Open Calculator

$$V = \frac{V_g}{Q_g}$$

$$20 = \frac{500\text{m}^3}{25}$$

12) Volume of Each Grit Chamber

Open Calculator

$$V_T = (Q_p \cdot T_d)$$

$$45\text{m}^3 = (0.25\text{m}^3/\text{s} \cdot 3\text{min})$$

13) Volume of Grit

Open Calculator

$$V_g = Q_g \cdot V$$

$$500\text{m}^3 = 25 \cdot 20$$

14) Volume of Grit Chamber given Length of Grit Chamber

Open Calculator

$$V_T = (L \cdot W \cdot D)$$

$$44.99799\text{m}^3 = (6.92\text{m} \cdot 2.6\text{m} \cdot 2.501\text{m})$$

15) Width of Grit Chamber

Open Calculator

$$W = (R \cdot D)$$

$$2.57603\text{m} = (1.03 \cdot 2.501\text{m})$$

16) Width using Length of Grit Chamber

Open Calculator

$$W = \left(\frac{V_T}{D \cdot L}\right)$$

$$2.600116\text{m} = \left(\frac{45\text{m}^3}{2.501\text{m} \cdot 6.92\text{m}}\right)$$

Variables Used

- **A** Chosen Air Supply *(Square Meter per Second)*
- A_s Air Supply Required *(Cubic Meter per Second)*
- **D** Depth of Grit Chamber *(Meter)*
- **L** Length of Grit Chamber *(Meter)*
- Q_g Assumed Grit Quantity in Cubic Meter per MLD
- Q_p Peak Flow Rate *(Cubic Meter per Second)*
- **R** Selected Width Ratio
- T_d Detention Time *(Minute)*
- **V** Volumetric Flow Rate in Million Litres per Day
- V_g Volume of Grit *(Cubic Meter)*
- V_T Volume of Grit Chamber *(Cubic Meter)*
- **W** Width of Grit Chamber *(Meter)*

Constants, Functions, Measurements used

- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Time** in Minute (min)
  Time Unit Conversion
- Measurement: **Volume** in Cubic Meter (m^3)
  Volume Unit Conversion
- Measurement: **Volumetric Flow Rate** in Cubic Meter per Second (m^3/s)
  Volumetric Flow Rate Unit Conversion
- Measurement: **Kinematic Viscosity** in Square Meter per Second (m^2/s)
  Kinematic Viscosity Unit Conversion

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