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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

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

[Open Calculator !\[\]\(a870788d6ed9b8fd294b7654a8c8526b_img.jpg\)](#)

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

2) Assumed Grit Quantity given Volume of Grit

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

[Open Calculator !\[\]\(c50c8b7b2cc2cf9ff925edec0ee94c0d_img.jpg\)](#)

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

3) Chamber Length using Air Supply required

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

[Open Calculator !\[\]\(f60b7a900783ac3fd531bfd9c111be6d_img.jpg\)](#)

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



4) Chosen Air Supply given Air Supply required 

$$fx \quad A = A_s \cdot L$$

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

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

5) Chosen Depth given Width of Grit Chamber 

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

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

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

6) Depth given Length of Grit Chamber 

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

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

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

7) Detention Time given Volume of Each Grit Chamber 

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

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

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



8) Length of Grit Chamber 

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

[Open Calculator !\[\]\(e78f798d4ea5c530c9db49e7d26e6b95_img.jpg\)](#)

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

9) Peak Flow Rate given Volume of Each Grit Chamber 

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

[Open Calculator !\[\]\(05be7c7a8995decd503647c99211f7c2_img.jpg\)](#)


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

10) Selected Width-Ratio given Width of Grit Chamber 

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

[Open Calculator !\[\]\(fe3aebe81acea8d45108cd2768939da7_img.jpg\)](#)

$$ex \quad 1.039584 = \frac{2.6m}{2.501m}$$


11) Volume Flow Rate given Volume of Grit 

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

[Open Calculator !\[\]\(899d8b7697d64725bf017d3296cfcf1b_img.jpg\)](#)

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




12) Volume of Each Grit Chamber 

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

[Open Calculator !\[\]\(e2376d476d06eb31946dc01a69a4403a_img.jpg\)](#)


$$ex \quad 45m^3 = (0.25m^3/s \cdot 3min)$$

13) Volume of Grit 

$$fx \quad V_g = Q_g \cdot V$$

[Open Calculator !\[\]\(0b5e7e25e8775f7e7e80906ada4f0021_img.jpg\)](#)

$$ex \quad 500m^3 = 25 \cdot 20$$

14) Volume of Grit Chamber given Length of Grit Chamber 

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

[Open Calculator !\[\]\(bd3b31712ad9bab5a241210fa6925cdd_img.jpg\)](#)

$$ex \quad 44.99799m^3 = (6.92m \cdot 2.6m \cdot 2.501m)$$

15) Width of Grit Chamber 

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

[Open Calculator !\[\]\(7bc43b319a082987e20f7bf78f4bab80_img.jpg\)](#)

$$ex \quad 2.57603m = (1.03 \cdot 2.501m)$$

16) Width using Length of Grit Chamber 

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

[Open Calculator !\[\]\(4a7b4ce770af8456e11a71f9565c8c2b_img.jpg\)](#)

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








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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