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Design of Parabolic Grit Chamber Formulas

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List of 41 Design of Parabolic Grit Chamber Formulas

Design of Parabolic Grit Chamber

Parabolic Grit Chamber

1) Area of Parabolic Channel given Width of Parabolic Channel

Open Calculator

fx $$A_p = \frac{w \cdot d}{1.5}$$

ex $$3.49864\text{m}^2 = \frac{1.299\text{m} \cdot 4.04\text{m}}{1.5}$$

2) Constant given Discharge for Rectangular Channel Section

Open Calculator

fx $$x_o = \left(\frac{Q_e}{d}\right)$$

ex $$9.856436 = \left(\frac{39.82\text{m}^3/\text{s}}{4.04\text{m}}\right)$$

3) Flow Area of Throat given Discharge

Open Calculator

fx $$F_{area} = \frac{Q_e}{V_c}$$

ex $$7.869565\text{m}^2 = \frac{39.82\text{m}^3/\text{s}}{5.06\text{m}/\text{s}}$$

4) Head Loss given Critical Velocity

Open Calculator

fx $$h_f = 0.1 \cdot \left(\frac{(V_c)^2}{2 \cdot g} \right)$$

ex $$0.130631\text{m} = 0.1 \cdot \left(\frac{(5.06\text{m}/\text{s})^2}{2 \cdot 9.8\text{m}/\text{s}^2} \right)$$

5) Total Critical Energy

Open Calculator

fx $$E_c = \left(d_c + \left(\frac{(V_c)^2}{2 \cdot g} \right) + \left(0.1 \cdot \left(\frac{(V_c)^2}{2 \cdot g} \right) \right) \right)$$

ex $$4.056937\text{m} = \left(2.62\text{m} + \left(\frac{(5.06\text{m}/\text{s})^2}{2 \cdot 9.8\text{m}/\text{s}^2} \right) + \left(0.1 \cdot \left(\frac{(5.06\text{m}/\text{s})^2}{2 \cdot 9.8\text{m}/\text{s}^2} \right) \right) \right)$$

6) Total Energy at Critical Point

Open Calculator

$$E_c = \left(d_c + \left(\frac{(V_c)^2}{2 \cdot g} \right) + h_f \right)$$

$$4.056306\text{m} = \left(2.62\text{m} + \left(\frac{(5.06\text{m/s})^2}{2 \cdot 9.8\text{m/s}^2} \right) + 0.130\text{m} \right)$$

Critical Depth

7) Critical Depth at Different Discharges

Open Calculator

$$d_c = \left(\frac{(Q_e)^2}{g \cdot (W_t)^2} \right)^{\frac{1}{3}}$$

$$2.619658\text{m} = \left(\frac{(39.82\text{m}^3/\text{s})^2}{9.8\text{m/s}^2 \cdot (3\text{m})^2} \right)^{\frac{1}{3}}$$

8) Critical Depth given Depth of Parabolic Channel

Open Calculator

$$d_c = \left(\frac{d}{1.55} \right)$$

$$2.606452\text{m} = \left(\frac{4.04\text{m}}{1.55} \right)$$

9) Critical Depth given Discharge through Control Section

Open Calculator

fx $$d_c = \left(\frac{Q_e}{W_t \cdot V_c}\right)$$

ex $$2.623188\text{m} = \left(\frac{39.82\text{m}^3/\text{s}}{3\text{m} \cdot 5.06\text{m/s}}\right)$$

10) Critical Depth given Maximum Discharge

Open Calculator

fx $$d_c = \left(\frac{Q_p}{W_t \cdot V_c}\right)$$

ex $$2.619895\text{m} = \left(\frac{39.77\text{m}^3/\text{s}}{3\text{m} \cdot 5.06\text{m/s}}\right)$$

11) Critical Depth in Control Section

Open Calculator

fx $$d_c = \left(\frac{(V_c)^2}{g}\right)$$

ex $$2.612612\text{m} = \left(\frac{(5.06\text{m/s})^2}{9.8\text{m/s}^2}\right)$$

Critical Velocity

12) Critical Velocity given Critical Depth in Control Section

Open Calculator

fx $$V_c = \sqrt{d_c \cdot g}$$

ex $$5.067149\text{m/s} = \sqrt{2.62\text{m} \cdot 9.8\text{m/s}^2}$$

13) Critical Velocity given Depth of Section

Open Calculator

fx $$V_c = \sqrt{\frac{d \cdot g}{1.55}}$$

ex $$5.054031\text{m/s} = \sqrt{\frac{4.04\text{m} \cdot 9.8\text{m/s}^2}{1.55}}$$

14) Critical Velocity given Discharge

Open Calculator

fx $$V_c = \left(\frac{Q_e}{F_{area}}\right)$$

ex $$5.066158\text{m/s} = \left(\frac{39.82\text{m}^3\text{/s}}{7.86\text{m}^2}\right)$$

15) Critical Velocity given Discharge through Control Section

Open Calculator

fx $$V_c = \left(\frac{Q_e}{W_t \cdot d_c} \right)$$

ex $$5.066158\text{m/s} = \left(\frac{39.82\text{m}^3\text{/s}}{3\text{m} \cdot 2.62\text{m}} \right)$$

16) Critical Velocity given Head Loss

Open Calculator

fx $$V_c = \left(\frac{h_f \cdot 2 \cdot g}{0.1} \right)^{\frac{1}{2}}$$

ex $$5.047772\text{m/s} = \left(\frac{0.130\text{m} \cdot 2 \cdot 9.8\text{m/s}^2}{0.1} \right)^{\frac{1}{2}}$$

17) Critical Velocity given Maximum Discharge

Open Calculator

fx $$V_c = \left(\frac{Q_p}{W_t \cdot d_c} \right)$$

ex $$5.059796\text{m/s} = \left(\frac{39.77\text{m}^3\text{/s}}{3\text{m} \cdot 2.62\text{m}} \right)$$

18) Critical Velocity given Total Energy at Critical Point

Open Calculator

fx $$V_c = \sqrt{2 \cdot g \cdot (E_c - (d_c + h_f))}$$

ex $$5.047772\text{m/s} = \sqrt{2 \cdot 9.8\text{m/s}^2 \cdot (4.05\text{m} - (2.62\text{m} + 0.130\text{m}))}$$

Depth of Channel

19) Depth given Critical Velocity

Open Calculator

fx $$d = 1.55 \cdot \left(\frac{(V_c)^2}{g} \right)$$

ex $$4.049549\text{m} = 1.55 \cdot \left(\frac{(5.06\text{m/s})^2}{9.8\text{m/s}^2} \right)$$

20) Depth given Discharge for Rectangular Channel Section

Open Calculator

fx $$d = \frac{Q_e}{x_o}$$

ex $$4.040179\text{m} = \frac{39.82\text{m}^3/\text{s}}{9.856}$$

21) Depth of Parabolic Channel given Critical Depth

Open Calculator

fx $$d = 1.55 \cdot d_c$$

ex $$4.061\text{m} = 1.55 \cdot 2.62\text{m}$$

22) Depth of Parabolic Channel given Width of Parabolic Channel

Open Calculator

fx $$d_p = \frac{1.5 \cdot A_{filter}}{w}$$

ex $$57.73672\text{m} = \frac{1.5 \cdot 50.0\text{m}^2}{1.299\text{m}}$$

Discharge in Channel

23) Discharge Coefficient with known Discharge

Open Calculator

fx $$C_D = -\log\left(\frac{Q_{th}}{c}, d\right)$$

ex $$0.271095 = -\log\left(\frac{0.04\text{m}^3/\text{s}}{6.9}, 4.04\text{m}\right)$$

24) Discharge for Rectangular Channel Section

Open Calculator

fx $$Q_e = A_{cs} \cdot \left(R^{\frac{2}{3}}\right) \cdot \frac{i^{\frac{1}{2}}}{n}$$

ex $$46.2992\text{m}^3/\text{s} = 3.5\text{m}^2 \cdot \left((2.000\text{m})^{\frac{2}{3}}\right) \cdot \frac{(0.01)^{\frac{1}{2}}}{0.012}$$

25) Discharge given Critical Depth

Open Calculator

fx $$Q_e = \sqrt{\left((d_c)^3\right) \cdot g \cdot (W_t)^2}$$

ex $$39.82779\text{m}^3/\text{s} = \sqrt{\left((2.62\text{m})^3\right) \cdot 9.8\text{m/s}^2 \cdot (3\text{m})^2}$$

26) Discharge given Flow Area of Throat

Open Calculator

fx $$Q_e = F_{area} \cdot V_c$$

ex $$39.7716\text{m}^3/\text{s} = 7.86\text{m}^2 \cdot 5.06\text{m/s}$$

27) Discharge Passing through Parshall Flume given Discharge Coefficient

Open Calculator

fx $Q_e = c \cdot (d)^{C_D}$

ex $10.0594\text{m}^3/\text{s} = 6.9 \cdot (4.04\text{m})^{0.27}$

28) Discharge through Control Section

Open Calculator

fx $Q_e = W_t \cdot V_c \cdot d_c$

ex $39.7716\text{m}^3/\text{s} = 3\text{m} \cdot 5.06\text{m/s} \cdot 2.62\text{m}$

29) Maximum Discharge given Width of Throat

Open Calculator

fx $Q_p = W_t \cdot V_c \cdot d_c$

ex $39.7716\text{m}^3/\text{s} = 3\text{m} \cdot 5.06\text{m/s} \cdot 2.62\text{m}$

Width of Channel

30) Width of Parabolic Channel

Open Calculator

fx $w = \frac{1.5 \cdot A_{cs}}{d}$

ex $1.299505\text{m} = \frac{1.5 \cdot 3.5\text{m}^2}{4.04\text{m}}$

31) Width of Throat given Critical Depth

Open Calculator

fx $$W_t = \sqrt{\frac{(Q_e)^2}{g \cdot (d_c)^3}}$$

ex $$2.999413\text{m} = \sqrt{\frac{(39.82\text{m}^3/\text{s})^2}{9.8\text{m}/\text{s}^2 \cdot (2.62\text{m})^3}}$$

32) Width of Throat given Discharge through Control Section

Open Calculator

fx $$W_t = \left(\frac{Q_e}{d_c \cdot V_c}\right)$$

ex $$3.003651\text{m} = \left(\frac{39.82\text{m}^3/\text{s}}{2.62\text{m} \cdot 5.06\text{m}/\text{s}}\right)$$

33) Width of Throat given Maximum Discharge

Open Calculator

fx $$W_t = \left(\frac{Q_p}{d_c \cdot V_c}\right)$$

ex $$2.999879\text{m} = \left(\frac{39.77\text{m}^3/\text{s}}{2.62\text{m} \cdot 5.06\text{m}/\text{s}}\right)$$

Parshall Flume

34) Depth of Flow in Parshall Flume given Discharge Coefficient 1.5

Open Calculator

fx $$H_a = \left(\frac{Q_e}{1.5}\right)^{\frac{1}{np}}$$

ex $$7.762583\text{m} = \left(\frac{39.82\text{m}^3/\text{s}}{1.5}\right)^{\frac{1}{1.6}}$$

35) Depth of Flow in Upstream Leg of Flume at One Third Point given Discharge

Open Calculator

fx $$d_f = \left(\frac{Q_e}{2.264 \cdot W_t}\right)^{\frac{2}{3}}$$

ex $$3.25139\text{m} = \left(\frac{39.82\text{m}^3/\text{s}}{2.264 \cdot 3\text{m}}\right)^{\frac{2}{3}}$$

36) Depth of Parshall Flume given Discharge

Open Calculator

fx $$d_f = \left(\frac{Q_e}{c}\right)^{\frac{1}{np}}$$

ex $$2.990767\text{m} = \left(\frac{39.82\text{m}^3/\text{s}}{6.9}\right)^{\frac{1}{1.6}}$$

37) Depth of Parshall Flume given Width

Open Calculator

$$d_{pf} = (c \cdot w)^{\frac{1}{C_D - 1}}$$

$$0.049575\text{m} = (6.9 \cdot 1.299\text{m})^{\frac{1}{0.27-1}}$$

38) Discharge Passing through Parshall Flume

Open Calculator

$$Q_e = \left(2.264 \cdot W_t \cdot (d_f)^{\frac{3}{2}}\right)$$

$$40.71633\text{m}^3/\text{s} = \left(2.264 \cdot 3\text{m} \cdot (3.3\text{m})^{\frac{3}{2}}\right)$$

39) Width of Parshall Flume given Depth

Open Calculator

$$w_p = \frac{(d)^{C_D - 1}}{c}$$

$$0.052299\text{m} = \frac{(4.04\text{m})^{0.27-1}}{6.9}$$

40) Width of Parshall Flume given Depth of Parshall Flume

Open Calculator

$$w = \sqrt{\frac{d}{c}}$$

$$0.765184\text{m} = \sqrt{\frac{4.04\text{m}}{6.9}}$$

41) Width of Throat given Discharge

Open Calculator

fx $$W_t = \frac{Q_e}{2.264 \cdot (d_f)^{\frac{3}{2}}}$$

ex $$2.933958\text{m} = \frac{39.82\text{m}^3/\text{s}}{2.264 \cdot (3.3\text{m})^{\frac{3}{2}}}$$

Variables Used

- A_{cs} Area of Cross Section *(Square Meter)*
- A_{filter} Area of Trickling Filter *(Square Meter)*
- A_p Area of Parabolic Channel *(Square Meter)*
- c Integration Constant
- C_D Discharge Coefficient
- d Depth *(Meter)*
- d_c Critical Depth *(Meter)*
- d_f Depth of Flow *(Meter)*
- d_p Depth of Parabolic Channel *(Meter)*
- d_{pf} Depth of Parshall Flume given Width *(Meter)*
- E_c Energy at Critical Point *(Meter)*
- F_{area} Flow Area of Throat *(Square Meter)*
- g Acceleration due to Gravity *(Meter per Square Second)*
- H_a Depth of Flow in Parshall Flume *(Meter)*
- h_f Head Loss *(Meter)*
- i Slope of Bed
- n Manning’s Roughness Coefficient
- n_p Constant for a 6-inch Parshall flume
- Q_e Environmental Discharge *(Cubic Meter per Second)*
- Q_p Peak Discharge *(Cubic Meter per Second)*
- Q_{th} Theoretical Discharge *(Cubic Meter per Second)*

- **R** Hydraulic Radius *(Meter)*
- **V_c** Critical Velocity *(Meter per Second)*
- **w** Width *(Meter)*
- **w_p** Width of Parshall Flume given Depth *(Meter)*
- **W_t** Width of Throat *(Meter)*
- **x_o** Constant

Constants, Functions, Measurements used

- Function: **log**, log(Base, Number)
  Logarithmic function is an inverse function to exponentiation.
- Function: **sqrt**, sqrt(Number)
  A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Area** in Square Meter (m^2)
  Area Unit Conversion
- Measurement: **Speed** in Meter per Second (m/s)
  Speed Unit Conversion
- Measurement: **Acceleration** in Meter per Square Second (m/s^2)
  Acceleration Unit Conversion
- Measurement: **Volumetric Flow Rate** in Cubic Meter per Second (m^3/s)
  Volumetric Flow Rate Unit Conversion

Check other formula lists

- **Design of Parabolic Grit Chamber Formulas**

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