Important Design of Parabolic Grit Chamber Formulas PDF

Formulas
Examples
with Units

List of 41
Important Design of Parabolic Grit Chamber Formulas

1) Parabolic Grit Chamber Formulas

1.1) Area of Parabolic Channel given Width of Parabolic Channel Formula

Evaluate Formula

Formula

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

Example with Units

$$3.4986\,\text{m}^2 = \frac{1.299\,\text{m} \cdot 4.04\,\text{m}}{1.5}$$

1.2) Constant given Discharge for Rectangular Channel Section Formula

Evaluate Formula

Formula

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

Example with Units

$$9.8564 = \left(\frac{39.82\,\text{m}^3/\text{s}}{4.04\,\text{m}}\right)$$

1.3) Flow Area of Throat given Discharge Formula

Evaluate Formula

Formula

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

Example with Units

$$7.8696\,\text{m}^2 = \frac{39.82\,\text{m}^3/\text{s}}{5.06\,\text{m/s}}$$

1.4) Head Loss given Critical Velocity Formula

Evaluate Formula

Formula

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

Example with Units

$$0.1306\,\text{m} = 0.1 \cdot \left(\frac{\left(5.06\,\text{m/s}\right)^2}{2 \cdot 9.8\,\text{m/s}^2}\right)$$

1.5) Total Critical Energy Formula

Evaluate Formula

Formula

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

Example with Units

$$4.0569\,\text{m} = \left(2.62\,\text{m} + \left(\frac{\left(5.06\,\text{m/s} \right)^2}{2 \cdot 9.8\,\text{m/s}^2} \right) + \left(0.1 \cdot \left(\frac{\left(5.06\,\text{m/s} \right)^2}{2 \cdot 9.8\,\text{m/s}^2} \right) \right) \right)$$

1.6) Total Energy at Critical Point Formula

Evaluate Formula

Formula

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

Example with Units

$$4.0563\,\text{m} = \left(2.62\,\text{m} + \left(\frac{\left(5.06\,\text{m/s} \right)^2}{2 \cdot 9.8\,\text{m/s}^2} \right) + 0.130\,\text{m} \right)$$

1.7) Critical Depth Formulas

1.7.1) Critical Depth at Different Discharges Formula

Evaluate Formula

Formula

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

Example with Units

$$2.6197\,\text{m} = \left(\frac{\left(39.82\,\text{m}^3\text{/s} \right)^2}{9.8\,\text{m/s}^2 \cdot \left(3\,\text{m} \right)^2} \right)^{\frac{1}{3}}$$

1.7.2) Critical Depth given Depth of Parabolic Channel Formula

Evaluate Formula

Formula

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

Example with Units

$$2.6065\,\text{m} = \left(\frac{4.04\,\text{m}}{1.55} \right)$$

1.7.3) Critical Depth given Discharge through Control Section Formula

Evaluate Formula

Formula

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

Example with Units

$$2.6232\,\text{m} = \left(\frac{39.82\,\text{m}^3\text{/s}}{3\,\text{m} \cdot 5.06\,\text{m/s}} \right)$$

1.7.4) Critical Depth given Maximum Discharge Formula

Evaluate Formula

Formula

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

Example with Units

$$2.6199\,\text{m} = \left(\frac{39.77\,\text{m}^3/\text{s}}{3\,\text{m} \cdot 5.06\,\text{m/s}} \right)$$

1.7.5) Critical Depth in Control Section Formula

Evaluate Formula

Formula

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

Example with Units

$$2.6126\,\text{m} = \left(\frac{\left(5.06\,\text{m/s} \right)^2}{9.8\,\text{m/s}^2} \right)$$

1.8) Critical Velocity Formulas

1.8.1) Critical Velocity given Critical Depth in Control Section Formula

Evaluate Formula

Formula

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

Example with Units

$$5.0671\,\text{m/s} = \sqrt{2.62\,\text{m} \cdot 9.8\,\text{m/s}^2}$$

1.8.2) Critical Velocity given Depth of Section Formula

Evaluate Formula

Formula

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

Example with Units

$$5.054\,\text{m/s} = \sqrt{\frac{4.04\,\text{m} \cdot 9.8\,\text{m/s}^2}{1.55}}$$

1.8.3) Critical Velocity given Discharge Formula

Evaluate Formula

Formula

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

Example with Units

$$5.0662\,\text{m/s} = \left(\frac{39.82\,\text{m}^3/\text{s}}{7.86\,\text{m}^2} \right)$$

1.8.4) Critical Velocity given Discharge through Control Section Formula

Evaluate Formula

Formula

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

Example with Units

$$5.0662\,\text{m/s} = \left(\frac{39.82\,\text{m}^3/\text{s}}{3\,\text{m} \cdot 2.62\,\text{m}} \right)$$

1.8.5) Critical Velocity given Head Loss Formula

Evaluate Formula

Formula

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

Example with Units

$$5.0478\,\text{m/s} = \left(\frac{0.130\,\text{m} \cdot 2 \cdot 9.8\,\text{m/s}^2}{0.1} \right)^{\frac{1}{2}}$$

1.8.6) Critical Velocity given Maximum Discharge Formula

Evaluate Formula

Formula

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

Example with Units

$$5.0598\,\text{m/s} = \left(\frac{39.77\,\text{m}^3/\text{s}}{3\,\text{m} \cdot 2.62\,\text{m}} \right)$$

1.8.7) Critical Velocity given Total Energy at Critical Point Formula

Evaluate Formula

Formula

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

Example with Units

$$5.0478\,\text{m/s} = \sqrt{2 \cdot 9.8\,\text{m/s}^2 \cdot \left(4.05\,\text{m} - \left(2.62\,\text{m} + 0.130\,\text{m} \right) \right)}$$

1.9) Depth of Channel Formulas

1.9.1) Depth given Critical Velocity Formula

Evaluate Formula

Formula

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

Example with Units

$$4.0495\,\text{m} = 1.55 \cdot \left(\frac{\left(5.06\,\text{m/s} \right)^2}{9.8\,\text{m/s}^2} \right)$$

1.9.2) Depth given Discharge for Rectangular Channel Section Formula

Evaluate Formula

Formula

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

Example with Units

$$4.0402\,\text{m} = \frac{39.82\,\text{m}^3/\text{s}}{9.856}$$

1.9.3) Depth of Parabolic Channel given Critical Depth Formula

Evaluate Formula

Formula

$$d = 1.55 \cdot d_c$$

Example with Units

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

1.9.4) Depth of Parabolic Channel given Width of Parabolic Channel Formula

Evaluate Formula

Formula

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

Example with Units

$$57.7367\,\text{m} = \frac{1.5 \cdot 50.0\,\text{m}^2}{1.299\,\text{m}}$$

1.10) Discharge in Channel Formulas

1.10.1) Discharge Coefficient with known Discharge Formula

Evaluate Formula

Formula

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

Example with Units

$$0.2711 = -\log\left(\frac{0.04\,m^3/s}{6.9}, 4.04\,m\right)$$

1.10.2) Discharge for Rectangular Channel Section Formula

Evaluate Formula

Formula

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

Example with Units

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

1.10.3) Discharge given Critical Depth Formula

Evaluate Formula

Formula

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

Example with Units

$$39.8278\,m^3/s = \sqrt{\left(\left(2.62\,m\right)^3\right) \cdot 9.8\,m/s^2 \cdot \left(3\,m\right)^2}$$

1.10.4) Discharge given Flow Area of Throat Formula

Evaluate Formula

Formula

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

Example with Units

$$39.7716\,m^3/s = 7.86\,m^2 \cdot 5.06\,m/s$$

1.10.5) Discharge Passing through Parshall Flume given Discharge Coefficient Formula

Evaluate Formula

Formula

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

Example with Units

$$10.0594\,m^3/s = 6.9 \cdot \left(4.04\,m\right)^{0.27}$$

1.10.6) Discharge through Control Section Formula

Evaluate Formula

Formula

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

Example with Units

$$39.7716\,m^3/s = 3\,m \cdot 5.06\,m/s \cdot 2.62\,m$$

1.10.7) Maximum Discharge given Width of Throat Formula

Evaluate Formula

Formula

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

Example with Units

$$39.7716\,m^3/s = 3\,m \cdot 5.06\,m/s \cdot 2.62\,m$$

1.11) Width of Channel Formulas

1.11.1) Width of Parabolic Channel Formula

Evaluate Formula

Formula

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

Example with Units

$$1.2995\,\text{m} = \frac{1.5 \cdot 3.5\,\text{m}^2}{4.04\,\text{m}}$$

1.11.2) Width of Throat given Critical Depth Formula

Evaluate Formula

Formula

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

Example with Units

$$2.9994\,\text{m} = \sqrt{\frac{\left(39.82\,\text{m}^3/\text{s}\right)^2}{9.8\,\text{m/s}^2 \cdot \left(2.62\,\text{m}\right)^3}}$$

1.11.3) Width of Throat given Discharge through Control Section Formula

Evaluate Formula

Formula

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

Example with Units

$$3.0037\,\text{m} = \left(\frac{39.82\,\text{m}^3/\text{s}}{2.62\,\text{m} \cdot 5.06\,\text{m/s}}\right)$$

1.11.4) Width of Throat given Maximum Discharge Formula

Evaluate Formula

Formula

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

Example with Units

$$2.9999\,\text{m} = \left(\frac{39.77\,\text{m}^3/\text{s}}{2.62\,\text{m} \cdot 5.06\,\text{m/s}}\right)$$

2) Parshall Flume Formulas

2.1) Depth of Flow in Parshall Flume given Discharge Coefficient 1.5 Formula

Evaluate Formula

Formula

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

Example with Units

$$7.7626\,\text{m} = \left(\frac{39.82\,\text{m}^3/\text{s}}{1.5}\right)^{\frac{1}{1.6}}$$

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

Evaluate Formula

Formula

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

Example with Units

$$3.2514\,\text{m} = \left(\frac{39.82\,\text{m}^3/\text{s}}{2.264 \cdot 3\,\text{m}}\right)^{\frac{2}{3}}$$

2.3) Depth of Parshall Flume given Discharge Formula

Evaluate Formula

Formula

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

Example with Units

$$2.9908\,\text{m} = \left(\frac{39.82\,\text{m}^3/\text{s}}{6.9}\right)^{\frac{1}{1.6}}$$

2.4) Depth of Parshall Flume given Width Formula

Evaluate Formula

Formula

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

Example with Units

$$0.0496\,\text{m} = \left(6.9 \cdot 1.299\,\text{m}\right)^{\frac{1}{0.27 - 1}}$$

2.5) Discharge Passing through Parshall Flume Formula

Evaluate Formula

Formula

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

Example with Units

$$40.7163\,\text{m}^3/\text{s} = \left(2.264 \cdot 3\,\text{m} \cdot \left(3.3\,\text{m}\right)^{\frac{3}{2}}\right)$$

2.6) Width of Parshall Flume given Depth Formula

Evaluate Formula

Formula

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

Example with Units

$$0.0523\,\text{m} = \frac{\left(4.04\,\text{m}\right)^{0.27 - 1}}{6.9}$$

2.7) Width of Parshall Flume given Depth of Parshall Flume Formula

Evaluate Formula

Formula

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

Example with Units

$$0.7652\,\text{m} = \sqrt{\frac{4.04\,\text{m}}{6.9}}$$

2.8) Width of Throat given Discharge Formula

Evaluate Formula

Formula

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

Example with Units

$$2.934\,\text{m} = \frac{39.82\,\text{m}^3/\text{s}}{2.264 \cdot \left(3.3\,\text{m}\right)^{\frac{3}{2}}}$$

Variables used in list of Design of Parabolic Grit Chamber Formulas above

- 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 in list of Design of Parabolic Grit Chamber Formulas above

- Functions: **log**, log(Base, Number)
  Logarithmic function is an inverse function to exponentiation.
- Functions: **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 (m²)
  Area Unit Conversion
- Measurement: **Speed** in Meter per Second (m/s)
  Speed Unit Conversion
- Measurement: **Acceleration** in Meter per Square Second (m/s²)
  Acceleration Unit Conversion
- Measurement: **Volumetric Flow Rate** in Cubic Meter per Second (m³/s)
  Volumetric Flow Rate Unit Conversion

Download other Important Constant Velocity Horizontal Flow Grit Channels PDFs

- Important Design of Parabolic Grit Chamber Formulas
- Important Design of Proportioning Flow Weir Formulas

Try our Unique Visual Calculators

- Percentage decrease
- HCF of three numbers
- Multiply fraction

Please SHARE this PDF with someone who needs it!

This PDF can be downloaded in these languages

English Spanish French German Russian Italian Portuguese Polish Dutch

9/18/2024 | 11:16:49 AM UTC