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# Design of Proportioning Flow Weir Formulas

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# List of 14 Design of Proportioning Flow Weir Formulas

## Design of Proportioning Flow Weir

### 1) Coefficient of Discharge given Distance in X Direction from Center of Weir

Open Calculator

fx $$C_d = \left( \frac{2 \cdot W_c \cdot V_h}{x \cdot \pi \cdot \sqrt{2 \cdot g \cdot y}} \right)$$

ex $$0.677869 = \left( \frac{2 \cdot 2.0\text{m} \cdot 10\text{m/s}}{3.00\text{m} \cdot \pi \cdot \sqrt{2 \cdot 9.8\text{m/s}^2 \cdot 2.00\text{m}}} \right)$$

### 2) Distance in X Direction from Center of Weir

Open Calculator

fx $$x = \left( \frac{2 \cdot W_c \cdot V_h}{C_d \cdot \pi \cdot \sqrt{2 \cdot g \cdot y}} \right)$$

ex $$3.081223\text{m} = \left( \frac{2 \cdot 2.0\text{m} \cdot 10\text{m/s}}{0.66 \cdot \pi \cdot \sqrt{2 \cdot 9.8\text{m/s}^2 \cdot 2.00\text{m}}} \right)$$

## 3) Distance in Y Direction from Crest of Weir

Open Calculator

fx $$y = \left( \frac{2 \cdot W_c \cdot V_h}{C_d \cdot \pi \cdot x \cdot \sqrt{2 \cdot g}} \right)^2$$

ex $$2.109764\text{m} = \left( \frac{2 \cdot 2.0\text{m} \cdot 10\text{m/s}}{0.66 \cdot \pi \cdot 3.00\text{m} \cdot \sqrt{2 \cdot 9.8\text{m/s}^2}} \right)^2$$

## 4) Half Width of Bottom Portion of Weir

Open Calculator

fx $$W_h = 1.467 \cdot V_h \cdot W_c$$

ex $$29.34\text{m} = 1.467 \cdot 10\text{m/s} \cdot 2.0\text{m}$$

## 5) Horizontal Flow Velocity given Distance in X Direction from Center of Weir

Open Calculator

fx $$V_h = \frac{x}{\frac{2 \cdot W_c}{C_d \cdot \pi \cdot \sqrt{2 \cdot g \cdot y}}}$$

ex $$9.736393\text{m/s} = \frac{3.00\text{m}}{\frac{2 \cdot 2.0\text{m}}{0.66 \cdot \pi \cdot \sqrt{2 \cdot 9.8\text{m/s}^2 \cdot 2.00\text{m}}}}$$

## 6) Horizontal Flow Velocity given Half Width of Bottom Portion of Weir

Open Calculator

fx $$V_h = \frac{W_h}{1.467 \cdot W_c}$$

ex $$10\text{m/s} = \frac{29.34\text{m}}{1.467 \cdot 2.0\text{m}}$$

## 7) Width of Channel given Distance in X Direction from Center of Weir

Open Calculator

fx $$w = \frac{x}{\frac{2 \cdot V_h}{C_d \cdot \pi \cdot \sqrt{2 \cdot g \cdot y}}}$$

ex $$1.947279\text{m} = \frac{3.00\text{m}}{\frac{2 \cdot 10\text{m/s}}{0.66 \cdot \pi \cdot \sqrt{2 \cdot 9.8\text{m/s}^2 \cdot 2.00\text{m}}}}$$

## 8) Width of Channel given Half Width of Bottom Portion of Weir

Open Calculator

fx $$W_c = \frac{W_h}{1.467 \cdot V_h}$$

ex $$2\text{m} = \frac{29.34\text{m}}{1.467 \cdot 10\text{m/s}}$$

# Modified Shield's Formula

## 9) Diameter of Particle given Maximum Critical Scour Velocity

Open Calculator

fx $$D = \left( \frac{v_{maxs}}{4.5 \cdot \sqrt{g \cdot (G - 1)}} \right)^2$$

ex $$0.839394\text{m} = \left( \frac{49.97\text{m/s}}{4.5 \cdot \sqrt{9.8\text{m/s}^2 \cdot (15.99 - 1)}} \right)^2$$

## 10) Diameter of Particle given Minimum Critical Scour Velocity

Open Calculator

fx $$D_p = \left( \frac{v_{mins}}{3 \cdot \sqrt{g \cdot (G - 1)}} \right)^2$$

ex $$0.027666\text{m} = \left( \frac{6.048\text{m/s}}{3 \cdot \sqrt{9.8\text{m/s}^2 \cdot (15.99 - 1)}} \right)^2$$

## 11) Maximum Critical Scour Velocity

Open Calculator

fx $$v_{maxs} = \left( 4.5 \cdot \sqrt{g \cdot D \cdot (G - 1)} \right)$$

ex $$49.95827\text{m/s} = \left( 4.5 \cdot \sqrt{9.8\text{m/s}^2 \cdot 0.839\text{m} \cdot (15.99 - 1)} \right)$$

## 12) Minimum Critical Scour Velocity

Open Calculator

fx $$v_{mins} = \left(3 \cdot \sqrt{g \cdot D_p \cdot (G - 1)}\right)$$

ex $$6.046202\text{m/s} = \left(3 \cdot \sqrt{9.8\text{m/s}^2 \cdot 0.02765\text{m} \cdot (15.99 - 1)}\right)$$

## 13) Specific Gravity given Maximum Critical Scour Velocity

Open Calculator

fx $$G = \left(\left(\frac{v_{maxs}}{4.5 \cdot \sqrt{g \cdot D}}\right)^2\right) + 1$$

ex $$15.99704 = \left(\left(\frac{49.97\text{m/s}}{4.5 \cdot \sqrt{9.8\text{m/s}^2 \cdot 0.839\text{m}}}\right)^2\right) + 1$$

## 14) Specific Gravity given Minimum Critical Scour Velocity

Open Calculator

fx $$G = \left(\left(\frac{v_{mins}}{3 \cdot \sqrt{g \cdot D_p}}\right)^2\right) + 1$$

ex $$15.99892 = \left(\left(\frac{6.048\text{m/s}}{3 \cdot \sqrt{9.8\text{m/s}^2 \cdot 0.02765\text{m}}}\right)^2\right) + 1$$

# Variables Used

- $C_d$ Coefficient of Discharge
- $D$ Diameter of Particle(Max Critical Scour Velocity) *(Meter)*
- $D_p$ Diameter of Particle(Min Critical Scour Velocity) *(Meter)*
- $g$ Acceleration due to Gravity *(Meter per Square Second)*
- $G$ Specific Gravity of Particle
- $V_h$ Horizontal Flow Velocity *(Meter per Second)*
- $v_{maxs}$ Maximum Critical Scour Velocity *(Meter per Second)*
- $v_{mins}$ Minimum Critical Scour Velocity *(Meter per Second)*
- $w$ Width *(Meter)*
- $W_c$ Channel Width *(Meter)*
- $W_h$ Half Width of Bottom Portion of Weir *(Meter)*
- $x$ Distance in x Direction *(Meter)*
- $y$ Distance in y Direction *(Meter)*

# Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  *Archimedes' constant*
- 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: **Speed** in Meter per Second (m/s)
  *Speed Unit Conversion*
- Measurement: **Acceleration** in Meter per Square Second (m/s²)
  *Acceleration Unit Conversion*

## Check other formula lists

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

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