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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

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

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

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

2) Distance in X Direction from Center of Weir

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

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

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



3) Distance in Y Direction from Crest of Weir

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

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

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

4) Half Width of Bottom Portion of Weir

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

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

$$ex \quad 29.34m = 1.467 \cdot 10m/s \cdot 2.0m$$

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

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

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

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



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

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

Open Calculator 

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

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

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

Open Calculator 

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

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

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

Open Calculator 

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



Modified Shield's Formula

9) Diameter of Particle given Maximum Critical Scour Velocity

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

[Open Calculator !\[\]\(74d4806277d7e73349d8e8c0897931e9_img.jpg\)](#)

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

10) Diameter of Particle given Minimum Critical Scour Velocity

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

[Open Calculator !\[\]\(8bba887393ca45b761e5cb49e755e762_img.jpg\)](#)

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

11) Maximum Critical Scour Velocity

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

[Open Calculator !\[\]\(0fb13ad0bfa3d86868cdd3883e5665b3_img.jpg\)](#)

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



12) Minimum Critical Scour Velocity

[Open Calculator !\[\]\(eafc244b53721dd1ec133f0772f70fc7_img.jpg\)](#)

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

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

13) Specific Gravity given Maximum Critical Scour Velocity

[Open Calculator !\[\]\(10f8862fc183b400327470ea85afe9ae_img.jpg\)](#)

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

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

14) Specific Gravity given Minimum Critical Scour Velocity

[Open Calculator !\[\]\(35dc653d59570f8f891c312eeece91a2_img.jpg\)](#)

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

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






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_{max}** Maximum Critical Scour Velocity (Meter per Second)
- **V_{min}** 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 



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