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Broad Crested Weir Formulas

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List of 20 Broad Crested Weir Formulas

Broad Crested Weir

1) Actual Discharge over Broad Crested Weir

Open Calculator

fx $$Q_a = C_d \cdot L_w \cdot h_c \cdot \sqrt{(2 \cdot g) \cdot (H - h_c)}$$

ex $$17.54701\text{m}^3/\text{s} = 0.66 \cdot 3\text{m} \cdot 1.001\text{m} \cdot \sqrt{(2 \cdot 9.8\text{m/s}^2) \cdot (5\text{m} - 1.001\text{m})}$$

2) Additional Head given Head for Broad Crested Weir

Open Calculator

fx $$h_a = H_{Upstream} - H$$

ex $$5.1\text{m} = 10.1\text{m} - 5\text{m}$$

3) Coefficient of Discharge for Max Discharge over Crested Weir

Open Calculator

fx $$C_d = \frac{Q_{W(max)}}{1.70 \cdot L_w \cdot (H)^{\frac{3}{2}}}$$

ex $$0.659421 = \frac{37.6\text{m}^3/\text{s}}{1.70 \cdot 3\text{m} \cdot (5\text{m})^{\frac{3}{2}}}$$

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4) Coefficient of Discharge given Actual Discharge over Broad Crested Weir

Open Calculator

fx $$C_d = \frac{Q_a}{L_w \cdot h_c \cdot \sqrt{(2 \cdot g) \cdot (H - h_c)}}$$

ex $$0.659737 = \frac{17.54 m^3/s}{3m \cdot 1.001m \cdot \sqrt{(2 \cdot 9.8 m/s^2) \cdot (5m - 1.001m)}}$$

5) Coefficient of Discharge given Discharge of Weir if Critical Depth is Constant

Open Calculator

fx $$C_d = \frac{Q_w}{1.70 \cdot L_w \cdot (H)^{\frac{3}{2}}}$$

ex $$0.466505 = \frac{26.6 m^3/s}{1.70 \cdot 3m \cdot (5m)^{\frac{3}{2}}}$$

6) Critical Depth due to Reduction in Area of Flow Section given Total Head

Open Calculator

fx $$h_c = H - \left(\frac{v_f^2}{2 \cdot g} \right)$$

ex $$1.04898m = 5m - \left(\frac{(8.8 m/s)^2}{2 \cdot 9.8 m/s^2} \right)$$

7) Discharge over Broad Crested Weir

Open Calculator

$$Q_w = L_w \cdot h_c \cdot \sqrt{(2 \cdot [g]) \cdot (H - h_c)}$$

$$26.59539\text{m}^3/\text{s} = 3\text{m} \cdot 1.001\text{m} \cdot \sqrt{(2 \cdot [g]) \cdot (5\text{m} - 1.001\text{m})}$$

8) Head for Broad Crested Weir

Open Calculator

$$H_{Upstream} = (H + h_a)$$

$$10.01\text{m} = (5\text{m} + 5.01\text{m})$$

9) Head if Velocity is considered for Discharge over Broad Crested Weir

Open Calculator

$$H = \left(\frac{Q_{W(max)}}{1.70 \cdot C_d \cdot L_w} \right)^{\frac{2}{3}}$$

$$4.997074\text{m} = \left(\frac{37.6\text{m}^3/\text{s}}{1.70 \cdot 0.66 \cdot 3\text{m}} \right)^{\frac{2}{3}}$$

10) Length of Crest given Actual Discharge over Broad Crested Weir

Open Calculator

$$L_w = \frac{Q_a}{C_d \cdot h_c \cdot \sqrt{(2 \cdot g) \cdot (H - h_c)}}$$

$$2.998802\text{m} = \frac{17.54\text{m}^3/\text{s}}{0.66 \cdot 1.001\text{m} \cdot \sqrt{(2 \cdot 9.8\text{m/s}^2) \cdot (5\text{m} - 1.001\text{m})}}$$

11) Length of Crest given Discharge over Weir

Open Calculator

$$L_w = \frac{Q_w}{h_c \cdot \sqrt{(2 \cdot [g]) \cdot (H - h_c)}}$$

$$3.00052\text{m} = \frac{26.6\text{m}^3/\text{s}}{1.001\text{m} \cdot \sqrt{(2 \cdot [g]) \cdot (5\text{m} - 1.001\text{m})}}$$

12) Length of Crest if Critical Depth is Constant for Discharge of Weir

Open Calculator

$$L_w = \frac{Q_w}{1.70 \cdot C_d \cdot (H)^{\frac{3}{2}}}$$

$$2.120478\text{m} = \frac{26.6\text{m}^3/\text{s}}{1.70 \cdot 0.66 \cdot (5\text{m})^{\frac{3}{2}}}$$

13) Length of Crest over Broad Crested Weir for Max Discharge

Open Calculator

$$L_w = \frac{Q_{W(max)}}{1.70 \cdot C_d \cdot (H)^{\frac{3}{2}}}$$

$$2.997367\text{m} = \frac{37.6\text{m}^3/\text{s}}{1.70 \cdot 0.66 \cdot (5\text{m})^{\frac{3}{2}}}$$

14) Max Discharge over Broad Crested Weir

Open Calculator

$$Q_{W(max)} = 1.70 \cdot C_d \cdot L_w \cdot (H)^{\frac{3}{2}}$$

$$37.63302\text{m}^3/\text{s} = 1.70 \cdot 0.66 \cdot 3\text{m} \cdot (5\text{m})^{\frac{3}{2}}$$

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15) Maximum Discharge of Broad Crested Weir if Critical Depth is Constant

Open Calculator

fx $$Q_{W(max)} = 1.70 \cdot C_d \cdot L_w \cdot (H)^{\frac{3}{2}}$$

ex $$37.63302\text{m}^3/\text{s} = 1.70 \cdot 0.66 \cdot 3\text{m} \cdot (5\text{m})^{\frac{3}{2}}$$

16) Total Head above Weir Crest

Open Calculator

fx $$H = h_c + \left(\frac{v_f^2}{2 \cdot g}\right)$$

ex $$4.95202\text{m} = 1.001\text{m} + \left(\frac{(8.8\text{m/s})^2}{2 \cdot 9.8\text{m/s}^2}\right)$$

17) Total Head for Actual Discharge over Broad Crested Weir

Open Calculator

fx $$H = \left(\left(\left(\frac{Q_a}{C_d \cdot L_w \cdot h_c}\right)^2\right) \cdot \left(\frac{1}{2 \cdot g}\right)\right) + h_c$$

ex $$4.996808\text{m} = \left(\left(\left(\frac{17.54\text{m}^3/\text{s}}{0.66 \cdot 3\text{m} \cdot 1.001\text{m}}\right)^2\right) \cdot \left(\frac{1}{2 \cdot 9.8\text{m/s}^2}\right)\right) + 1.001\text{m}$$

18) Total Head for Maximum Discharge

Open Calculator

fx $$H = \left(\frac{Q_{W(max)}}{1.70 \cdot C_d \cdot L_w} \right)^{\frac{2}{3}}$$

ex $$4.997074\text{m} = \left(\frac{37.6\text{m}^3/\text{s}}{1.70 \cdot 0.66 \cdot 3\text{m}} \right)^{\frac{2}{3}}$$

19) Total Head given Discharge over Weir Crest

Open Calculator

fx $$H = \left(\left(\frac{Q_w}{L_w \cdot h_c} \right)^2 \right) \cdot \left(\frac{1}{2 \cdot [g]} \right) + h_c$$

ex $$5.001386\text{m} = \left(\left(\frac{26.6\text{m}^3/\text{s}}{3\text{m} \cdot 1.001\text{m}} \right)^2 \right) \cdot \left(\frac{1}{2 \cdot [g]} \right) + 1.001\text{m}$$

20) Velocity of Flow given Head

Open Calculator

fx $$v_f = \sqrt{(2 \cdot g) \cdot (H - h_c)}$$

ex $$8.853271\text{m/s} = \sqrt{(2 \cdot 9.8\text{m/s}^2) \cdot (5\text{m} - 1.001\text{m})}$$

Variables Used

- C_d Coefficient of Discharge
- g Acceleration due to Gravity *(Meter per Square Second)*
- H Total Head *(Meter)*
- h_a Additional Head *(Meter)*
- h_c Critical Depth of Weir *(Meter)*
- $H_{Upstream}$ Head on Upstream of Weir *(Meter)*
- L_w Length of Weir Crest *(Meter)*
- Q_a Actual Discharge over Broad Crested Weir *(Cubic Meter per Second)*
- Q_w Discharge Over Broad Crested Weir *(Cubic Meter per Second)*
- $Q_{W(max)}$ Max Discharge Over Broad Crested Weir *(Cubic Meter per Second)*
- v_f Velocity of Fluid for Weir *(Meter per Second)*

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Constants, Functions, Measurements used

- Constant: **[g]**, 9.80665
  Gravitational acceleration on Earth
- 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/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

- **Broad Crested Weir Formulas**
- **Flow Over a Trapizoidal and Triangular Weir or Notch Formulas**
- **Flow Over Rectangular Sharp Crested Weir or Notch Formulas**
- **Submerged Weirs Formulas**
- **Time Required to Empty a Reservoir with Rectangular Weir Formulas**

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