



## **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

 $\mathbf{K} igg| \mathrm{Q_a} = \mathrm{C_d} \cdot \mathrm{L_w} \cdot \mathrm{h_c} \cdot \sqrt{(2 \cdot \mathrm{g}) \cdot (\mathrm{H} - \mathrm{h_c})}$ 

Open Calculator

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

- 2) Additional Head given Head for Broad Crested Weir
- $\mathbf{h}_{\mathrm{a}} = \mathbf{H}_{\mathrm{Upstream}} \mathbf{H}$

Open Calculator

- $= 5.1 \mathrm{m} = 10.1 \mathrm{m} 5 \mathrm{m}$
- 3) Coefficient of Discharge for Max Discharge over Crested Weir
- $extbf{C}_{ ext{d}} = rac{ ext{Q}_{ ext{W(max)}}}{1.70 \cdot ext{L}_{ ext{w}} \cdot ( ext{H})^{rac{3}{2}}}$

Open Calculator

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

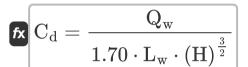


## 4) Coefficient of Discharge given Actual Discharge over Broad Crested Weir

 $\left| \mathrm{C_d} = rac{\mathrm{Q_a}}{\mathrm{L_w} \cdot \mathrm{h_c} \cdot \sqrt{(2 \cdot \mathrm{g}) \cdot (\mathrm{H} - \mathrm{h_c})}} 
ight|$ 

Open Calculator

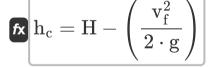
# 5) Coefficient of Discharge given Discharge of Weir if Critical Depth is Constant



Open Calculator

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

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



Open Calculator 🗗

$$extbf{ex} 1.04898 ext{m} = 5 ext{m} - \left(rac{(8.8 ext{m/s})^2}{2 \cdot 9.8 ext{m/s}^2}
ight)$$



#### 7) Discharge over Broad Crested Weir

 $\mathbf{K} \mathbf{Q}_{\mathrm{w}} = \mathbf{L}_{\mathrm{w}} \cdot \mathbf{h}_{\mathrm{c}} \cdot \sqrt{(2 \cdot [\mathrm{g}]) \cdot (\mathrm{H} - \mathrm{h}_{\mathrm{c}})}$ 

Open Calculator

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

#### 8) Head for Broad Crested Weir

 $\mathbf{f}_{\mathbf{W}}\mathbf{H}_{\mathrm{Upstream}} = (\mathbf{H} + \mathbf{h}_{\mathrm{a}})$ 

Open Calculator

 $[10.01 \mathrm{m} = (5 \mathrm{m} + 5.01 \mathrm{m})]$ 

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

$$\mathbf{E} \mathbf{H} = \left( rac{\mathbf{Q}_{\mathrm{W(max)}}}{1.70 \cdot \mathrm{Cd} \cdot \mathrm{Lw}} 
ight)^{rac{2}{3}}$$

Open Calculator 🗹

 $ext{ex} \left[ 4.997074 ext{m} = \left( rac{37.6 ext{m}^3/ ext{s}}{1.70 \cdot 0.66 \cdot 3 ext{m}} 
ight)^{rac{2}{3}}$ 

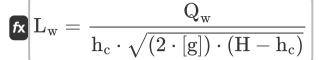
## 10) Length of Crest given Actual Discharge over Broad Crested Weir

$$\mathbf{L}_{\mathrm{w}} = rac{\mathrm{Q_{a}}}{\mathrm{C_{d} \cdot h_{c} \cdot \sqrt{(2 \cdot \mathrm{g}) \cdot (\mathrm{H} - \mathrm{h_{c}})}}}$$

Open Calculator



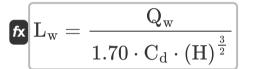
#### 11) Length of Crest given Discharge over Weir



Open Calculator

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

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

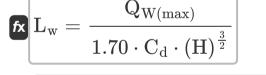


ge of weir 🗳

Open Calculator

 $\mathbf{ex} \left[ 2.120478 \mathrm{m} = rac{26.6 \mathrm{m}^3 / \mathrm{s}}{1.70 \cdot 0.66 \cdot (5 \mathrm{m})^{rac{3}{2}}} 
ight]$ 

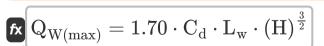
## 13) Length of Crest over Broad Crested Weir for Max Discharge



Open Calculator 🗗

 $ext{ex} \ 2.997367 ext{m} = rac{37.6 ext{m}^3/ ext{s}}{1.70 \cdot 0.66 \cdot (5 ext{m})^{rac{3}{2}}}$ 

### 14) Max Discharge over Broad Crested Weir



Open Calculator

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







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

$$\mathbf{Q}_{\mathrm{W(max)}} = 1.70 \cdot \mathrm{C_d} \cdot \mathrm{L_w} \cdot \mathrm{(H)}^{rac{3}{2}}$$

Open Calculator

$$\mathbf{ex} \ 37.63302 \mathrm{m}^3/\mathrm{s} = 1.70 \cdot 0.66 \cdot 3\mathrm{m} \cdot (5\mathrm{m})^{rac{3}{2}}$$

16) Total Head above Weir Crest

$$\mathbf{H} = \mathbf{h}_{\mathrm{c}} + \left(rac{\mathbf{v}_{\mathrm{f}}^2}{2\cdot\mathbf{g}}
ight)^{2}$$

Open Calculator 🖸

$$ext{ex} \ 4.95202 ext{m} = 1.001 ext{m} + \left(rac{(8.8 ext{m/s})^2}{2 \cdot 9.8 ext{m/s}^2}
ight)$$

17) Total Head for Actual Discharge over Broad Crested Weir 🛂

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

ex

$$oxed{4.996808 ext{m} = \left( \left( \left( rac{17.54 ext{m}^3/ ext{s}}{0.66 \cdot 3 ext{m} \cdot 1.001 ext{m}} 
ight)^2 
ight) \cdot \left( rac{1}{2 \cdot 9.8 ext{m}/ ext{s}^2} 
ight) 
ight) + 1.001 ext{m}}$$





#### 18) Total Head for Maximum Discharge

 $\mathbf{H} = \left( \frac{\mathrm{Q_{W(max)}}}{1.70 \cdot \mathrm{Ca} \cdot \mathrm{Ler}} \right)^{\frac{2}{3}}$ 

Open Calculator 🗗

 $oxed{4.997074 ext{m} = \left(rac{37.6 ext{m}^3/ ext{s}}{1.70 \cdot 0.66 \cdot 3 ext{m}}
ight)^{rac{2}{3}}}$ 

### 19) Total Head given Discharge over Weir Crest

 $\mathbf{H} = \left( \left( rac{Q_w}{L_w \cdot h_c} 
ight)^2 
ight) \cdot \left( rac{1}{2 \cdot [g]} 
ight) + h_c$ 

Open Calculator

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

### 20) Velocity of Flow given Head

 $\left| \mathbf{v}_{\mathrm{f}} 
ight| \mathrm{v}_{\mathrm{f}} = \sqrt{(2 \cdot \mathrm{g}) \cdot (\mathrm{H} - \mathrm{h}_{\mathrm{c}})}$ 

Open Calculator 🗗

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



#### Variables Used

- C<sub>d</sub> Coefficient of Discharge
- g Acceleration due to Gravity (Meter per Square Second)
- **H** Total Head (Meter)
- **h**<sub>a</sub> Additional Head (Meter)
- **h**<sub>c</sub> Critical Depth of Weir (*Meter*)
- Hupstream Head on Upstream of Weir (Meter)
- L<sub>w</sub> Length of Weir Crest (Meter)
- Qa Actual Discharge over Broad Crested Weir (Cubic Meter per Second)
- Q<sub>w</sub> Discharge Over Broad Crested Weir (Cubic Meter per Second)
- Q<sub>W(max)</sub> Max Discharge Over Broad Crested Weir (Cubic Meter per Second)
- Vf Velocity of Fluid for Weir (Meter per Second)





#### 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/s²)
   Acceleration Unit Conversion
- Measurement: Volumetric Flow Rate in Cubic Meter per Second (m³/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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