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Flow Over Rectangular Sharp Crested Weir or Notch Formulas

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List of 41 Flow Over Rectangular Sharp Crested Weir or Notch Formulas

Flow Over Rectangular Sharp Crested Weir or Notch

1) Approach Velocity

Open Calculator

fx $$v = \frac{Q'}{b \cdot d_f}$$

ex $$15.4494\text{m/s} = \frac{153\text{m}^3\text{/s}}{3.001\text{m} \cdot 3.3\text{m}}$$

2) Bazins Formula for Discharge if Velocity is considered

Open Calculator

fx $$Q_{Bv} = m \cdot \sqrt{2 \cdot g} \cdot L_w \cdot H_{Stillwater}^{\frac{3}{2}}$$

ex $$91.65573\text{m}^3\text{/s} = 0.407 \cdot \sqrt{2 \cdot 9.8\text{m/s}^2} \cdot 3\text{m} \cdot (6.6\text{m})^{\frac{3}{2}}$$

3) Bazins Formula for Discharge if Velocity is not considered

Open Calculator

fx $$Q_{Bv1} = m \cdot \sqrt{2 \cdot g} \cdot L_w \cdot S_w^{\frac{3}{2}}$$

ex $$15.28934\text{m}^3\text{/s} = 0.407 \cdot \sqrt{2 \cdot 9.8\text{m/s}^2} \cdot 3\text{m} \cdot (2\text{m})^{\frac{3}{2}}$$

4) Coefficient for Bazin Formula

Open Calculator

fx $$m = 0.405 + \left(\frac{0.003}{S_w}\right)$$

ex $$0.4065 = 0.405 + \left(\frac{0.003}{2\text{m}}\right)$$

5) Coefficient for Bazin Formula if Velocity is considered

Open Calculator

fx $$m = 0.405 + \left(\frac{0.003}{H_{Stillwater}}\right)$$

ex $$0.405455 = 0.405 + \left(\frac{0.003}{6.6m}\right)$$

6) Coefficient of Discharge given Discharge if Velocity considered

Open Calculator

fx $$C_d = \frac{Q_{Fr} \cdot 3}{2 \cdot \left(\sqrt{2 \cdot g}\right) \cdot (L_w - 0.1 \cdot n \cdot H_{Stillwater}) \cdot \left(H_{Stillwater}^{\frac{3}{2}} - H_V^{\frac{3}{2}}\right)}$$

ex $$1.06198 = \frac{8m^3/s \cdot 3}{2 \cdot \left(\sqrt{2 \cdot 9.8m/s^2}\right) \cdot (3m - 0.1 \cdot 4 \cdot 6.6m) \cdot \left((6.6m)^{\frac{3}{2}} - (4.6m)^{\frac{3}{2}}\right)}$$

7) Coefficient of Discharge given Discharge if Velocity not considered

Open Calculator

fx $$C_d = \frac{Q_{Fr} \cdot 3}{2 \cdot \left(\sqrt{2 \cdot g}\right) \cdot (L_w - 0.1 \cdot n \cdot S_w) \cdot S_w^{\frac{3}{2}}}$$

ex $$0.435598 = \frac{8m^3/s \cdot 3}{2 \cdot \left(\sqrt{2 \cdot 9.8m/s^2}\right) \cdot (3m - 0.1 \cdot 4 \cdot 2m) \cdot (2m)^{\frac{3}{2}}}$$

8) Coefficient of Discharge given Discharge over Weir without considering Velocity

Open Calculator

fx $$C_d = \frac{Q_{Fr'} \cdot 3}{2 \cdot \left(\sqrt{2 \cdot g}\right) \cdot L_w \cdot S_w^{\frac{3}{2}}}$$

ex $$1.118034 = \frac{28m^3/s \cdot 3}{2 \cdot \left(\sqrt{2 \cdot 9.8m/s^2}\right) \cdot 3m \cdot (2m)^{\frac{3}{2}}}$$

9) Coefficient of Discharge given Discharge Passing over Weir considering Velocity

Open Calculator

fx $$C_d = \frac{Q_{Fr'} \cdot 3}{2 \cdot \left(\sqrt{2 \cdot g}\right) \cdot L_w \cdot \left((S_w + H_V)^{\frac{3}{2}} - H_V^{\frac{3}{2}}\right)}$$

ex $$0.446032 = \frac{28m^3/s \cdot 3}{2 \cdot \left(\sqrt{2 \cdot 9.8m/s^2}\right) \cdot 3m \cdot \left((2m + 4.6m)^{\frac{3}{2}} - (4.6m)^{\frac{3}{2}}\right)}$$

10) Coefficient when Bazin Formula for Discharge if Velocity is considered

Open Calculator

fx $$m = \frac{Q_{Bv}}{\sqrt{2 \cdot g} \cdot L_w \cdot H_{Stillwater}^{\frac{3}{2}}}$$

ex $$0.406975 = \frac{91.65m^3/s}{\sqrt{2 \cdot 9.8m/s^2} \cdot 3m \cdot (6.6m)^{\frac{3}{2}}}$$

11) Coefficient when Bazin Formula for Discharge Velocity is not considered

Open Calculator

fx $$m = \frac{Q_{Bv1}}{\sqrt{2 \cdot g} \cdot L_w \cdot S_w^{\frac{3}{2}}}$$

ex $$0.407284 = \frac{15.3m^3/s}{\sqrt{2 \cdot 9.8m/s^2} \cdot 3m \cdot (2m)^{\frac{3}{2}}}$$

12) Depth of Water Flow in Channel given Velocity Approach

Open Calculator

fx $$d_f = \frac{Q'}{b \cdot v}$$

ex $$3.376358m = \frac{153m^3/s}{3.001m \cdot 15.1m/s}$$

13) Francis Formula for Discharge for Rectangular Notch if Velocity is considered

Open Calculator

$$Q_{Fr} = 1.84 \cdot (L_w - 0.1 \cdot n \cdot H_{Stillwater}) \cdot \left(H_{Stillwater}^{\frac{3}{2}} - H_V^{\frac{3}{2}}\right)$$

$$4.696288\text{m}^3/\text{s} = 1.84 \cdot (3\text{m} - 0.1 \cdot 4 \cdot 6.6\text{m}) \cdot \left((6.6\text{m})^{\frac{3}{2}} - (4.6\text{m})^{\frac{3}{2}}\right)$$

14) Francis Formula for Discharge for Rectangular Notch if Velocity not considered

Open Calculator

$$Q_{Fr} = 1.84 \cdot (L_w - 0.1 \cdot n \cdot S_w) \cdot S_w^{\frac{3}{2}}$$

$$11.44947\text{m}^3/\text{s} = 1.84 \cdot (3\text{m} - 0.1 \cdot 4 \cdot 2\text{m}) \cdot (2\text{m})^{\frac{3}{2}}$$

15) Rehbocks Formula for Coefficient of Discharge

Open Calculator

$$C_d = 0.605 + 0.08 \cdot \left(\frac{S_w}{h_{Crest}}\right) + \left(\frac{0.001}{S_w}\right)$$

$$0.618833 = 0.605 + 0.08 \cdot \left(\frac{2\text{m}}{12\text{m}}\right) + \left(\frac{0.001}{2\text{m}}\right)$$

16) Rehbocks Formula for Discharge over Rectangular Weir

Open Calculator

$$Q_{Fr'} = \frac{2}{3} \cdot \left(0.605 + 0.08 \cdot \left(\frac{S_w}{h_{Crest}}\right) + \left(\frac{0.001}{S_w}\right)\right) \cdot \sqrt{2 \cdot g} \cdot L_w \cdot S_w^{\frac{3}{2}}$$

$$15.49804\text{m}^3/\text{s} = \frac{2}{3} \cdot \left(0.605 + 0.08 \cdot \left(\frac{2\text{m}}{12\text{m}}\right) + \left(\frac{0.001}{2\text{m}}\right)\right) \cdot \sqrt{2 \cdot 9.8\text{m/s}^2} \cdot 3\text{m} \cdot (2\text{m})^{\frac{3}{2}}$$

17) Width of Channel given Velocity Approach

Open Calculator

$$b = \frac{Q'}{v \cdot d_f}$$

$$3.070439\text{m} = \frac{153\text{m}^3/\text{s}}{15.1\text{m/s} \cdot 3.3\text{m}}$$

Discharge

18) Discharge considering Approach Velocity

Open Calculator

$$Q_{Fr} = \left(\frac{2}{3}\right) \cdot C_d \cdot \sqrt{2 \cdot g} \cdot (L_w - 0.1 \cdot n \cdot H_{Stillwater}) \cdot \left(H_{Stillwater}^{\frac{3}{2}} - H_V^{\frac{3}{2}}\right)$$

ex

$$4.971845\text{m}^3/\text{s} = \left(\frac{2}{3}\right) \cdot 0.66 \cdot \sqrt{2 \cdot 9.8\text{m/s}^2} \cdot (3\text{m} - 0.1 \cdot 4 \cdot 6.6\text{m}) \cdot \left((6.6\text{m})^{\frac{3}{2}} - (4.6\text{m})^{\frac{3}{2}}\right)$$

19) Discharge for Notch which is to be Calibrated

Open Calculator

$$Q_{Fr'} = k_{Flow} \cdot S_w^n$$

ex

$$29.44\text{m}^3/\text{s} = 1.84 \cdot (2\text{m})^4$$

20) Discharge given Velocity Approach

Open Calculator

$$Q' = v \cdot (b \cdot d_f)$$

ex

$$149.5398\text{m}^3/\text{s} = 15.1\text{m/s} \cdot (3.001\text{m} \cdot 3.3\text{m})$$

21) Discharge over Weir without considering Velocity

Open Calculator

$$Q_{Fr'} = \left(\frac{2}{3}\right) \cdot C_d \cdot \sqrt{2 \cdot g} \cdot L_w \cdot S_w^{\frac{3}{2}}$$

ex

$$16.52901\text{m}^3/\text{s} = \left(\frac{2}{3}\right) \cdot 0.66 \cdot \sqrt{2 \cdot 9.8\text{m/s}^2} \cdot 3\text{m} \cdot (2\text{m})^{\frac{3}{2}}$$

22) Discharge Passing over Weir considering Velocity

Open Calculator

fx $$Q_{Fr'} = \left(\frac{2}{3}\right) \cdot C_d \cdot \sqrt{2 \cdot g} \cdot L_w \cdot \left((S_w + H_V)^{\frac{3}{2}} - H_V^{\frac{3}{2}} \right)$$

ex $$41.43204 m^3/s = \left(\frac{2}{3}\right) \cdot 0.66 \cdot \sqrt{2 \cdot 9.8 m/s^2} \cdot 3m \cdot \left((2m + 4.6m)^{\frac{3}{2}} - (4.6m)^{\frac{3}{2}} \right)$$

23) Discharge when End Contractions is suppressed and Velocity is considered

Open Calculator

fx $$Q_{Fr'} = 1.84 \cdot L_w \cdot \left(H_{Stillwater}^{\frac{3}{2}} - H_V^{\frac{3}{2}} \right)$$

ex $$39.13573 m^3/s = 1.84 \cdot 3m \cdot \left((6.6m)^{\frac{3}{2}} - (4.6m)^{\frac{3}{2}} \right)$$

24) Discharge when End Contractions is suppressed and Velocity is not considered

Open Calculator

fx $$Q_{Fr'} = 1.84 \cdot L_w \cdot S_w^{\frac{3}{2}}$$

ex $$15.61292 m^3/s = 1.84 \cdot 3m \cdot (2m)^{\frac{3}{2}}$$

Hydraulic Head

25) Head given Coefficient for Bazin Formula

Open Calculator

fx $$S_w = \frac{0.003}{m - 0.405}$$

ex $$1.5m = \frac{0.003}{0.407 - 0.405}$$

26) Head given Coefficient using Bazin Formula and Velocity

Open Calculator

fx $$H_{Stillwater} = \frac{0.003}{m - 0.405}$$

ex $$1.5m = \frac{0.003}{0.407 - 0.405}$$

27) Head given Discharge through Notch which is to be Calibrated

Open Calculator

fx $$S_w = \left(\frac{Q_{Fr'}}{k_{Flow}}\right)^{\frac{1}{n}}$$

ex $$1.975082\text{m} = \left(\frac{28\text{m}^3/\text{s}}{1.84}\right)^{\frac{1}{4}}$$

28) Head over Crest for given Discharge without Velocity

Open Calculator

fx $$S_w = \left(\frac{Q_{Fr'} \cdot 3}{2 \cdot C_d \cdot \sqrt{2 \cdot g} \cdot L_w}\right)^{\frac{2}{3}}$$

ex $$2.842087\text{m} = \left(\frac{28\text{m}^3/\text{s} \cdot 3}{2 \cdot 0.66 \cdot \sqrt{2 \cdot 9.8\text{m}/\text{s}^2} \cdot 3\text{m}}\right)^{\frac{2}{3}}$$

29) Head over Crest given Discharge Passing over Weir with Velocity

Open Calculator

fx $$S_w = \left(\left(\frac{Q_{Fr'} \cdot 3}{2 \cdot C_d \cdot \sqrt{2 \cdot g} \cdot L_w}\right) + H_V^{\frac{3}{2}}\right)^{\frac{2}{3}} - H_V$$

ex $$1.389188\text{m} = \left(\left(\frac{28\text{m}^3/\text{s} \cdot 3}{2 \cdot 0.66 \cdot \sqrt{2 \cdot 9.8\text{m}/\text{s}^2} \cdot 3\text{m}}\right) + (4.6\text{m})^{\frac{3}{2}}\right)^{\frac{2}{3}} - 4.6\text{m}$$

30) Head when Bazin Formula for Discharge if Velocity is considered

Open Calculator

fx $$H_{Stillwater} = \left(\frac{Q_{Bv}}{m \cdot \sqrt{2 \cdot g} \cdot L_w}\right)^{\frac{2}{3}}$$

ex $$6.599725\text{m} = \left(\frac{91.65\text{m}^3/\text{s}}{0.407 \cdot \sqrt{2 \cdot 9.8\text{m}/\text{s}^2} \cdot 3\text{m}}\right)^{\frac{2}{3}}$$

31) Head when Bazin Formula for Discharge if Velocity is not considered

Open Calculator

fx $$S_w = \left(\frac{Q_{Bv1}}{m \cdot \sqrt{2 \cdot g} \cdot L_w} \right)^{\frac{2}{3}}$$

ex $$2.00093\text{m} = \left(\frac{15.3\text{m}^3/\text{s}}{0.407 \cdot \sqrt{2 \cdot 9.8\text{m/s}^2} \cdot 3\text{m}} \right)^{\frac{2}{3}}$$

32) Head when End Contractions is suppressed

Open Calculator

fx $$H_{Stillwater} = \left(\frac{Q_{Fr'}}{1.84 \cdot L_w} \right)^{\frac{2}{3}}$$

ex $$2.952201\text{m} = \left(\frac{28\text{m}^3/\text{s}}{1.84 \cdot 3\text{m}} \right)^{\frac{2}{3}}$$

Length of Crest

33) Length given Bazins Formula for Discharge if Velocity is not considered

Open Calculator

fx $$L_w = \frac{Q_{Bv1}}{m \cdot \sqrt{2 \cdot g} \cdot S_w^{\frac{3}{2}}}$$

ex $$3.002092\text{m} = \frac{15.3\text{m}^3/\text{s}}{0.407 \cdot \sqrt{2 \cdot 9.8\text{m/s}^2} \cdot (2\text{m})^{\frac{3}{2}}}$$

34) Length of Crest considering Velocity

Open Calculator

$$L_w = \left(\frac{3 \cdot Q_{Fr'}}{2 \cdot C_d \cdot \sqrt{2 \cdot g} \cdot \left(H_{Stillwater}^{\frac{3}{2}} - H_V^{\frac{3}{2}} \right)} \right) + (0.1 \cdot n \cdot H_{Stillwater})$$

ex $$4.667416\text{m} = \left(\frac{3 \cdot 28\text{m}^3/\text{s}}{2 \cdot 0.66 \cdot \sqrt{2 \cdot 9.8\text{m}/\text{s}^2} \cdot \left((6.6\text{m})^{\frac{3}{2}} - (4.6\text{m})^{\frac{3}{2}} \right)} \right) + (0.1 \cdot 4 \cdot 6.6\text{m})$$

35) Length of Crest given Discharge Passing over Weir

Open Calculator

$$L_w = \frac{Q_{Fr'} \cdot 3}{2 \cdot C_d \cdot \sqrt{2 \cdot g} \cdot \left((S_w + H_V)^{\frac{3}{2}} - H_V^{\frac{3}{2}} \right)}$$

ex $$2.027416\text{m} = \frac{28\text{m}^3/\text{s} \cdot 3}{2 \cdot 0.66 \cdot \sqrt{2 \cdot 9.8\text{m}/\text{s}^2} \cdot \left((2\text{m} + 4.6\text{m})^{\frac{3}{2}} - (4.6\text{m})^{\frac{3}{2}} \right)}$$

36) Length of Crest when Discharge and Velocity is considered

Open Calculator

$$L_w = \frac{Q_{Fr'}}{1.84 \cdot \left(H_{Stillwater}^{\frac{3}{2}} - H_V^{\frac{3}{2}} \right)}$$

ex $$2.146376\text{m} = \frac{28\text{m}^3/\text{s}}{1.84 \cdot \left((6.6\text{m})^{\frac{3}{2}} - (4.6\text{m})^{\frac{3}{2}} \right)}$$

37) Length of Crest when Discharge and Velocity is not considered

Open Calculator

$$L_w = \frac{Q_{Fr'}}{1.84 \cdot H_{Stillwater}^{\frac{3}{2}}}$$

ex $$0.897479\text{m} = \frac{28\text{m}^3/\text{s}}{1.84 \cdot (6.6\text{m})^{\frac{3}{2}}}$$

38) Length of Crest when Francis Formula Discharge and Velocity is considered

Open Calculator

fx $$L_w = \left(\frac{Q_{Fr}}{1.84 \cdot \left(H_{Stillwater}^{\frac{3}{2}} - H_V^{\frac{3}{2}} \right)} \right) + (0.1 \cdot n \cdot H_{Stillwater})$$

ex $$3.25325\text{m} = \left(\frac{8\text{m}^3/\text{s}}{1.84 \cdot \left((6.6\text{m})^{\frac{3}{2}} - (4.6\text{m})^{\frac{3}{2}} \right)} \right) + (0.1 \cdot 4 \cdot 6.6\text{m})$$

39) Length of Crest when Francis Formula Discharge and Velocity is not considered

Open Calculator

fx $$L_w = \left(\frac{Q_{Fr}}{1.84 \cdot S_w^{\frac{3}{2}}} \right) + (0.1 \cdot n \cdot S_w)$$

ex $$2.337189\text{m} = \left(\frac{8\text{m}^3/\text{s}}{1.84 \cdot (2\text{m})^{\frac{3}{2}}} \right) + (0.1 \cdot 4 \cdot 2\text{m})$$

40) Length of Crest without considering Velocity

Open Calculator

fx $$L_w = \left(\frac{Q_{Fr} \cdot 2}{3 \cdot C_d \cdot \sqrt{2 \cdot g}} \right)^{\frac{2}{3}} + (0.1 \cdot n \cdot S_w)$$

ex $$2.293543\text{m} = \left(\frac{8\text{m}^3/\text{s} \cdot 2}{3 \cdot 0.66 \cdot \sqrt{2 \cdot 9.8\text{m/s}^2}} \right)^{\frac{2}{3}} + (0.1 \cdot 4 \cdot 2\text{m})$$

41) Length when Bazins formula for Discharge if Velocity is considered

Open Calculator

fx $$L_w = \frac{Q_{Bv}}{m \cdot \sqrt{2 \cdot g} \cdot H_{Stillwater}^{\frac{3}{2}}}$$

ex $$2.999813\text{m} = \frac{91.65\text{m}^3/\text{s}}{0.407 \cdot \sqrt{2 \cdot 9.8\text{m/s}^2} \cdot (6.6\text{m})^{\frac{3}{2}}}$$

Variables Used

- **b** Width of Channel1 *(Meter)*
- **C_d** Coefficient of Discharge
- **d_f** Depth of Flow *(Meter)*
- **g** Acceleration due to Gravity *(Meter per Square Second)*
- **h_{Crest}** Height of Crest *(Meter)*
- **$H_{Stillwater}$** Still Water Head *(Meter)*
- **H_V** Velocity Head *(Meter)*
- **k_{Flow}** Constant of Flow
- **L_w** Length of Weir Crest *(Meter)*
- **m** Bazins Coefficient
- **n** Number of End Contraction
- **Q'** Discharge by Approach Velocity *(Cubic Meter per Second)*
- **Q_{Bv}** Bazins Discharge with Velocity *(Cubic Meter per Second)*
- **Q_{Bv1}** Bazins Discharge without Velocity *(Cubic Meter per Second)*
- **Q_{Fr}** Francis Discharge *(Cubic Meter per Second)*
- **$Q_{Fr'}$** Francis Discharge with Suppressed End *(Cubic Meter per Second)*
- **S_w** Height of Water above Crest of Weir *(Meter)*
- **v** Velocity of Flow 1 *(Meter per Second)*

Constants, Functions, Measurements used

- 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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