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Flow in Open Channels Formulas

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List of 19 Flow in Open Channels Formulas

Flow in Open Channels

1) Area of Flow for Circular Channel

Open Calculator

fx $$A = (R^2) \cdot \left(\theta - \left(\frac{\sin(2 \cdot \theta)}{2}\right)\right)$$

ex $$1.733345\text{m}^2 = \left((0.75\text{m})^2\right) \cdot \left(2.687\text{rad} - \left(\frac{\sin(2 \cdot 2.687\text{rad})}{2}\right)\right)$$

2) Bazin's constant

Open Calculator

fx $$K = (\sqrt{m}) \cdot \left(\left(\frac{157.6}{C}\right) - 1.81\right)$$

ex $$0.531147 = \left(\sqrt{0.423\text{m}}\right) \cdot \left(\left(\frac{157.6}{60}\right) - 1.81\right)$$

3) Chezy's constant considering Bazin formula

Open Calculator

fx $$C = \frac{157.6}{1.81 + \left(\frac{K}{\sqrt{m}}\right)}$$

ex $$60.00518 = \frac{157.6}{1.81 + \left(\frac{0.531}{\sqrt{0.423\text{m}}}\right)}$$

4) Chezy's constant considering Kutter's formula

Open Calculator

fx $$C = \frac{23 + \left(\frac{0.00155}{i}\right) + \left(\frac{1}{n}\right)}{1 + \left(23 + \left(\frac{0.00155}{i}\right)\right) \cdot \left(\frac{n}{\sqrt{m}}\right)}$$

ex $$60.72016 = \frac{23 + \left(\frac{0.00155}{0.005}\right) + \left(\frac{1}{0.0145}\right)}{1 + \left(23 + \left(\frac{0.00155}{0.005}\right)\right) \cdot \left(\frac{0.0145}{\sqrt{0.423m}}\right)}$$

5) Chezy's constant considering Manning's formula

Open Calculator

fx $$C = \left(\frac{1}{n}\right) \cdot \left(m^{\frac{1}{6}}\right)$$

ex $$59.75241 = \left(\frac{1}{0.0145}\right) \cdot \left((0.423m)^{\frac{1}{6}}\right)$$

6) Chezy's constant considering velocity

Open Calculator

fx $$C = \frac{v}{\sqrt{m \cdot i}}$$

ex $$60.01418 = \frac{2.76m/s}{\sqrt{0.423m \cdot 0.005}}$$

7) Critical depth considering flow in open channels

Open Calculator

fx $$h_c = \left(\frac{q^2}{[g]}\right)^{\frac{1}{3}}$$

ex $$0.389077\text{m} = \left(\frac{(0.76\text{m}^2/\text{s})^2}{[g]}\right)^{\frac{1}{3}}$$

8) Critical depth considering minimum specific energy

Open Calculator

fx $$h_c = \left(\frac{2}{3}\right) \cdot E_{min}$$

ex $$0.386667\text{m} = \left(\frac{2}{3}\right) \cdot 0.58\text{m}$$

9) Critical Depth using Critical Velocity

Open Calculator

fx $$h_c = \frac{V_c^2}{[g]}$$

ex $$0.387747\text{m} = \frac{(1.95\text{m/s})^2}{[g]}$$

10) Critical velocity considering flow in open channels

Open Calculator

fx $V_c = \sqrt{[g] \cdot h_c}$

ex $1.953148\text{m/s} = \sqrt{[g] \cdot 0.389\text{m}}$

11) Discharge per unit width considering flow in open channels

Open Calculator

fx $q = \sqrt{(h_c^3) \cdot [g]}$

ex $0.759775\text{m}^2\text{/s} = \sqrt{\left((0.389\text{m})^3\right) \cdot [g]}$

12) Hydraulic mean depth considering Bazin formula

Open Calculator

fx $m = \left(\frac{K}{\left(\left(\frac{157.6}{C}\right) - 1.81\right)}\right)^2$

ex $0.422765\text{m} = \left(\frac{0.531}{\left(\left(\frac{157.6}{60}\right) - 1.81\right)}\right)^2$

13) Hydraulic mean depth considering Manning's formula

Open Calculator

fx $m = (C \cdot n)^6$

ex $0.433626\text{m} = (60 \cdot 0.0145)^6$

14) Hydraulic mean depth using Chezy's formula

Open Calculator

fx $$m = \left(\frac{1}{i}\right) \cdot \left(\frac{v}{C}\right)^2$$

ex $$0.4232\text{m} = \left(\frac{1}{0.005}\right) \cdot \left(\frac{2.76\text{m/s}}{60}\right)^2$$

15) Manning's coefficient or constant

Open Calculator

fx $$n = \left(\frac{1}{C}\right) \cdot m^{\frac{1}{6}}$$

ex $$0.01444 = \left(\frac{1}{60}\right) \cdot (0.423\text{m})^{\frac{1}{6}}$$

16) Minimum Specific Energy using Critical Depth

Open Calculator

fx $$E_{min} = \left(\frac{3}{2}\right) \cdot h_c$$

ex $$0.5835\text{m} = \left(\frac{3}{2}\right) \cdot 0.389\text{m}$$

17) Radius of Circular Channel using Wetted Perimeter

Open Calculator

fx $$R = \frac{P}{2 \cdot \theta}$$

ex $$0.176777\text{m} = \frac{0.95\text{m}}{2 \cdot 2.687\text{rad}}$$

18) Velocity of Chezy's formula

Open Calculator

fx $v = C \cdot \sqrt{m \cdot i}$

ex $2.759348\text{m/s} = 60 \cdot \sqrt{0.423\text{m} \cdot 0.005}$

19) Wetted Perimeter for Circular Channel

Open Calculator

fx $P = 2 \cdot R \cdot \theta$

ex $4.0305\text{m} = 2 \cdot 0.75\text{m} \cdot 2.687\text{rad}$

Variables Used

- **A** Area of Flow of Circular Channel *(Square Meter)*
- **C** Chezy's Constant for Flow in Open Channel
- E_{min} Minimum Specific Energy for Open Channel Flow *(Meter)*
- h_c Critical Depth for Flow in Open Channel *(Meter)*
- **i** Slope of Bed of Open Channel
- **K** Bazin's Constant for Flow in Open Channel
- **m** Hydraulic Mean Depth for Open Channel *(Meter)*
- **n** Manning's Coefficient for Open Channel Flow
- **P** Wetted Perimeter of Circular Open Channel *(Meter)*
- **q** Discharge Per Unit Width in Open Channel *(Square Meter per Second)*
- **R** Radius of Circular Open Channel *(Meter)*
- **v** Flow Velocity in Open Channel *(Meter per Second)*
- V_c Critical Velocity for Flow in Open Channel *(Meter per Second)*
- **θ** Half Angle by Water Surface in Circular Channel *(Radian)*

Constants, Functions, Measurements used

- Constant: **[g]**, 9.80665
  Gravitational acceleration on Earth
- Function: **sin**, sin(Angle)
  Sine is a trigonometric function that describes the ratio of the length of the opposite side of a right triangle to the length of the hypotenuse.
- 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: **Area** in Square Meter (m²)
  Area Unit Conversion
- Measurement: **Speed** in Meter per Second (m/s)
  Speed Unit Conversion
- Measurement: **Angle** in Radian (rad)
  Angle Unit Conversion
- Measurement: **Kinematic Viscosity** in Square Meter per Second (m²/s)
  Kinematic Viscosity Unit Conversion

Check other formula lists

- **Flow in Open Channels Formulas**

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