Important Most Efficient Section of Channel Formulas PDF

Formulas
Examples
with Units

List of 38
Important Most Efficient Section of Channel Formulas

1) Circular Section Formulas

1.1) Chezy Constant given Discharge through Channels Formula

Evaluate Formula

Formula

$$C = \frac{Q}{\sqrt{\left(A^3\right) \cdot \frac{S}{p}}}$$

Example with Units

$$22.4 = \frac{14\,\text{m}^3/\text{s}}{\sqrt{\left(25\,\text{m}^2{}^3\right) \cdot \frac{0.0004}{16\,\text{m}}}}$$

1.2) Depth of Flow in most Efficient Channel for Maximum Discharge Formula

Evaluate Formula

Formula

$$D_f = 1.876 \cdot r'$$

Example with Units

$$5.628\,\text{m} = 1.876 \cdot 3\,\text{m}$$

1.3) Depth of Flow in most Efficient Channel for Maximum Velocity Formula

Evaluate Formula

Formula

$$D_f = 1.626 \cdot r'$$

Example with Units

$$4.878\,\text{m} = 1.626 \cdot 3\,\text{m}$$

1.4) Depth of flow in most Efficient Channel in circular channel Formula

Evaluate Formula

Formula

$$D_f = 1.8988 \cdot r'$$

Example with Units

$$5.6964\,\text{m} = 1.8988 \cdot 3\,\text{m}$$

1.5) Diameter of Section given Depth of Flow in most Efficient channel for Maximum Velocity Formula

Evaluate Formula

Formula

$$d_{section} = \frac{D_f}{0.81}$$

Example with Units

$$6.4198\,\text{m} = \frac{5.2\,\text{m}}{0.81}$$

1.6) Diameter of Section given Depth of flow in most Efficient Channel section Formula

Evaluate Formula

Formula

$$d_{section} = \frac{D_f}{0.95}$$

Example with Units

$$5.4737\,\text{m} = \frac{5.2\,\text{m}}{0.95}$$

1.7) Diameter of Section given Flow Depth in most Efficient Channel Formula

Evaluate Formula

Formula

$$d_{section} = \frac{D_f}{0.938}$$

Example with Units

$$5.5437\,\text{m} = \frac{5.2\,\text{m}}{0.938}$$

1.8) Diameter of Section given Hydraulic Radius in most Efficient Channel for Maximum Velocity Formula

Evaluate Formula

Formula

$$d_{section} = \frac{R_H}{0.3}$$

Example with Units

$$5.3333\,\text{m} = \frac{1.6\,\text{m}}{0.3}$$

1.9) Diameter of Section when Hydraulic Radius is at 0.9D Formula

Evaluate Formula

Formula

$$d_{section} = \frac{R_H}{0.29}$$

Example with Units

$$5.5172\,\text{m} = \frac{1.6\,\text{m}}{0.29}$$

1.10) Discharge through Channels Formula

Evaluate Formula

Formula

$$Q = C \cdot \sqrt{\left(A^3\right) \cdot \frac{S}{p}}$$

Example with Units

$$25\,\text{m}^3/\text{s} = 40 \cdot \sqrt{\left(25\,\text{m}^2{}^3\right) \cdot \frac{0.0004}{16\,\text{m}}}$$

1.11) Hydraulic Radius in most Efficient channel for Maximum Velocity Formula

Evaluate Formula

Formula

$$R_H = 0.6806 \cdot r'$$

Example with Units

$$2.0418\,\text{m} = 0.6806 \cdot 3\,\text{m}$$

1.12) Radius of Section given Depth of flow in Efficient Channel Formula

Evaluate Formula

Formula

$$r' = \frac{D_f}{1.8988}$$

Example with Units

$$2.7386\,\text{m} = \frac{5.2\,\text{m}}{1.8988}$$

1.13) Radius of Section given Depth of Flow in most Efficient Channel for Maximum Velocity Formula

Evaluate Formula

Formula

$$r' = \frac{D_f}{1.626}$$

Example with Units

$$3.198\,\text{m} = \frac{5.2\,\text{m}}{1.626}$$

1.14) Radius of Section given Depth of Flows in most Efficient Channel Formula

Evaluate Formula

Formula

$$r' = \frac{D_f}{1.876}$$

Example with Units

$$2.7719\,\text{m} = \frac{5.2\,\text{m}}{1.876}$$

1.15) Radius of Section given Hydraulic Radius Formula

Evaluate Formula

Formula

$$r' = \frac{R_H}{0.5733}$$

Example with Units

$$2.7909\,\text{m} = \frac{1.6\,\text{m}}{0.5733}$$

1.16) Radius of Section given Hydraulic Radius in most Efficient Channel for Maximum Velocity Formula

Evaluate Formula

Formula

$$r' = \frac{R_H}{0.6806}$$

Example with Units

$$2.3509\,\text{m} = \frac{1.6\,\text{m}}{0.6806}$$

1.17) Side Slope of Channel Bed given Discharge through Channels Formula

Evaluate Formula

Formula

$$S = \frac{p}{\frac{\left(A^3\right)}{\left(\frac{Q}{C}\right)^2}}$$

Example with Units

$$0.0001 = \frac{16\,\text{m}}{\frac{\left(25\,\text{m}^2\right)^3}{\left(\frac{14\,\text{m}^3/\text{s}}{40}\right)^2}}$$

1.18) Wetted Area given Discharge through Channels Formula

Evaluate Formula

Formula

$$A = \left(\left(\left(\frac{Q}{C}\right)^2\right) \cdot \frac{p}{S}\right)^{\frac{1}{3}}$$

Example with Units

$$16.985\,\text{m}^2 = \left(\left(\left(\frac{14\,\text{m}^3/\text{s}}{40}\right)^2\right) \cdot \frac{16\,\text{m}}{0.0004}\right)^{\frac{1}{3}}$$

1.19) Wetted Perimeter given Discharge through Channels Formula

Evaluate Formula

Formula

$$p = \frac{\left(A^3\right) \cdot S}{\left(\frac{Q}{C}\right)^2}$$

Example with Units

$$51.0204\,\text{m} = \frac{\left(25\,\text{m}^2\right)^3 \cdot 0.0004}{\left(\frac{14\,\text{m}^3/\text{s}}{40}\right)^2}$$

2) Rectangular Section Formulas

2.1) Depth of Flow given Hydraulic Radius in most Efficient Rectangular Channel Formula

Evaluate Formula

Formula

$$D_f = R_{H(rect)} \cdot 2$$

Example with Units

$$5.2\,\text{m} = 2.6\,\text{m} \cdot 2$$

2.2) Depth of Flow in Most Efficient Channel for Rectangular Channel Formula

Evaluate Formula

Formula

$$D_f = \frac{B_{rect}}{2}$$

Example with Units

$$5.2\,\text{m} = \frac{10.4\,\text{m}}{2}$$

2.3) Hydraulic Radius in most Efficient Open Channel Formula

Evaluate Formula

Formula

$$R_{H(rect)} = \frac{D_f}{2}$$

Example with Units

$$2.6\,\text{m} = \frac{5.2\,\text{m}}{2}$$

2.4) Width of Channel given Depth of flow in Most Efficient channels Formula

Evaluate Formula

Formula

$$B_{rect} = D_f \cdot 2$$

Example with Units

$$10.4\,\text{m} = 5.2\,\text{m} \cdot 2$$

3) Trapezoidal Section Formulas

3.1) Depth of Flow given Hydraulic Radius in Most Efficient Trapezoidal Channel Formula

Evaluate Formula

Formula

$$d_f = R_H \cdot 2$$

Example with Units

$$3.2\,\text{m} = 1.6\,\text{m} \cdot 2$$

3.2) Depth of Flow given Wetted Area in Most Efficient Channel for Bottom Width is kept Constant Formula

Evaluate Formula

Formula

$$d_f = \left(z_{trap} \cdot S_{Trap} \right)^{\frac{1}{2}}$$

Example with Units

$$3.2988\,\text{m} = \left(0.577 \cdot 18.86\,\text{m}^2 \right)^{\frac{1}{2}}$$

3.3) Depth of Flow in most Efficient Channel in Trapezoidal Channel Formula

Evaluate Formula

Formula

$$d_f = \frac{B_{trap}}{\frac{2}{\sqrt{3}}}$$

Example with Units

$$3.3\,\text{m} = \frac{3.8105\,\text{m}}{\frac{2}{\sqrt{3}}}$$

3.4) Depth of Flow in most Efficient Channel in Trapezoidal Channel given Channel Slope Formula

Evaluate Formula

Formula

$$d_f = \frac{B_{trap} \cdot 0.5}{\sqrt{\left(z_{trap}^2 \right) + 1} - z_{trap}}$$

Example with Units

$$3.299\,\text{m} = \frac{3.8105\,\text{m} \cdot 0.5}{\sqrt{\left(0.577^2 \right) + 1} - 0.577}$$

3.5) Depth of Flow when Width of Channel in Most Efficient Channel for Bottom Width is kept Constant Formula

Evaluate Formula

Formula

$$d_f = B_{trap} \cdot \frac{z_{trap}}{1 - \left(z_{trap}^2 \right)}$$

Example with Units

$$3.296\,\text{m} = 3.8105\,\text{m} \cdot \frac{0.577}{1 - \left(0.577^2 \right)}$$

3.6) Hydraulic Radius of Most Efficient Channel Formula

Evaluate Formula

Formula

$$R_H = \frac{d_f}{2}$$

Example with Units

$$1.65\,\text{m} = \frac{3.3\,\text{m}}{2}$$

3.7) Side Slope of Section for Depth of Flow is kept Constant Formula

Evaluate Formula

Formula

$$z_{trap} = \frac{1}{\sqrt{3}} \cdot \frac{d_f}{d_f}$$

Example with Units

$$0.5774 = \frac{1}{\sqrt{3}} \cdot \frac{3.3\,\text{m}}{3.3\,\text{m}}$$

3.8) Side Slope of Section given Wetted Area for Bottom Width is kept Constant Formula

Evaluate Formula

Formula

$$z_{trap} = d_f \cdot \frac{d_f}{S_{Trap}}$$

Example with Units

$$0.5774 = 3.3\,\text{m} \cdot \frac{3.3\,\text{m}}{18.86\,\text{m}^2}$$

3.9) Wetted Area in Most Efficient Channel for Bottom Width is kept Constant Formula

Evaluate Formula

Formula

$$S_{Trap} = d_f \cdot \frac{d_f}{z_{trap}}$$

Example with Units

$$18.8735\,\text{m}^2 = 3.3\,\text{m} \cdot \frac{3.3\,\text{m}}{0.577}$$

3.10) Width of Channel given Depth of Flow in Efficient Channel Formula

Evaluate Formula

Formula

$$B_{trap} = \left(\sqrt{\left(z_{trap}^{\,2}\right) + 1}\right) \cdot 2 \cdot d_f - 2 \cdot d_f \cdot z_{trap}$$

Example with Units

$$3.8117\,\text{m} = \left(\sqrt{\left(0.577^{\,2}\right) + 1}\right) \cdot 2 \cdot 3.3\,\text{m} - 2 \cdot 3.3\,\text{m} \cdot 0.577$$

3.11) Width of Channel in most Efficient Channel sections Formula

Evaluate Formula

Formula

$$B_{trap} = \left(\frac{2}{\sqrt{3}}\right) \cdot d_f$$

Example with Units

$$3.8105\,\text{m} = \left(\frac{2}{\sqrt{3}}\right) \cdot 3.3\,\text{m}$$

3.12) Width of Channel in Most Efficient Channel when Bottom width is kept constant Formula

Evaluate Formula

Formula

$$B_{trap} = d_f \cdot \left(\frac{1 - \left(z_{trap}^{\ 2} \right)}{z_{trap}} \right)$$

Example with Units

$$3.8151\,\text{m} = 3.3\,\text{m} \cdot \left(\frac{1 - \left(0.577^{\ 2} \right)}{0.577} \right)$$

3.13) Width of Channel in most Efficient Channels section Formula

Evaluate Formula

Formula

$$B_{trap} = \left(\frac{2}{\sqrt{3}} \right) \cdot d_f$$

Example with Units

$$3.8105\,\text{m} = \left(\frac{2}{\sqrt{3}} \right) \cdot 3.3\,\text{m}$$

4) Triangular Section Formulas

4.1) Depth of Flow given Hydraulic Radius in Most Efficient Triangular channel Formula

Evaluate Formula

Formula

$$d_{f(\Delta)} = R_{H(\Delta)} \cdot \left(2 \cdot \sqrt{2} \right)$$

Example with Units

$$3.3008\,\text{m} = 1.167\,\text{m} \cdot \left(2 \cdot \sqrt{2} \right)$$

4.2) Hydraulic Radius in Efficient channel Formula

Evaluate Formula

Formula

$$R_{H(\Delta)} = \frac{d_{f(\Delta)}}{2 \cdot \sqrt{2}}$$

Example with Units

$$1.1773\,\text{m} = \frac{3.33\,\text{m}}{2 \cdot \sqrt{2}}$$

Variables used in list of Most Efficient Section of Channel Formulas above

- **A** Wetted Surface Area of Channel *(Square Meter)*
- B_{rect} Width of Section of Rect Channel *(Meter)*
- B_{trap} Width of Trap Channel *(Meter)*
- **C** Chezy's Constant
- d_f Depth of Flow *(Meter)*
- D_f Depth of Flow of Channel *(Meter)*
- $d_{f(\Delta)}$ Depth of Flow of Triangle Channel *(Meter)*
- $d_{section}$ Diameter of Section *(Meter)*
- **p** Wetted Perimeter of Channel *(Meter)*
- **Q** Discharge of Channel *(Cubic Meter per Second)*
- **r'** Radius of Channel *(Meter)*
- R_H Hydraulic Radius of Channel *(Meter)*
- $R_{H(rect)}$ Hydraulic Radius of Rectangle *(Meter)*
- $R_{H(\Delta)}$ Hydraulic Radius of Triangular Channel *(Meter)*
- **S** Bed Slope
- S_{Trap} Wetted Surface Area of Trapezoidal Channel *(Square Meter)*
- z_{trap} Side slope of Trapezoidal Channel

Constants, Functions, Measurements used in list of Most Efficient Section of Channel Formulas above

- Functions: **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: **Volumetric Flow Rate** in Cubic Meter per Second (m³/s)
  Volumetric Flow Rate Unit Conversion

Download other Important Hydraulics and Waterworks PDFs

- Important Buoyancy And Floatation Formulas
- Important Culverts Formulas
- Important Devices to Measure Flow Rate Formulas
- Important Equations of Motion and Energy Equation Formulas
- Important Flow of Compressible Fluids Formulas
- Important Flow Over Notches and Weirs Formulas
- Important Fluid Pressure and Its Measurement Formulas
- Important Fundamentals of Fluid Flow Formulas
- Important Hydroelectric Power Generation Formulas
- Important Hydrostatic Forces on Surfaces Formulas
- Important Impact of Free Jets Formulas
- Important Impulse Momentum Equation and its Applications Formulas
- Important Liquids in Relative Equilibrium Formulas
- Important Most Efficient Section of Channel Formulas
- Important Non uniform Flow in Channels Formulas
- Important Properties of Fluid Formulas
- Important Thermal Expansion of Pipe and Pipe Stresses Formulas
- Important Uniform Flow in Channels Formulas
- Important Water Power Engineering Formulas

Try our Unique Visual Calculators

- Reverse percentage
- HCF calculator
- Simple fraction

Please SHARE this PDF with someone who needs it!

This PDF can be downloaded in these languages

English Spanish French German Russian Italian Portuguese Polish Dutch

9/18/2024 | 11:54:45 AM UTC