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Most Efficient Section of Channel Formulas

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List of 38 Most Efficient Section of Channel Formulas

Most Efficient Section of Channel

Circular Section

1) Chezy Constant given Discharge through Channels

Open Calculator

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

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

2) Depth of Flow in most Efficient Channel for Maximum Discharge

Open Calculator

fx $$D_f = 1.876 \cdot r'$$

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

3) Depth of Flow in most Efficient Channel for Maximum Velocity

Open Calculator

fx $$D_f = 1.626 \cdot r'$$

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

4) Depth of flow in most Efficient Channel in circular channel

Open Calculator

fx $D_f = 1.8988 \cdot r'$

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

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

Open Calculator

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

ex $6.419753\text{m} = \frac{5.2\text{m}}{0.81}$

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

Open Calculator

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

ex $5.473684\text{m} = \frac{5.2\text{m}}{0.95}$

7) Diameter of Section given Flow Depth in most Efficient Channel

Open Calculator

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

ex $5.54371\text{m} = \frac{5.2\text{m}}{0.938}$

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

Open Calculator

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

ex $$5.333333\text{m} = \frac{1.6\text{m}}{0.3}$$

9) Diameter of Section when Hydraulic Radius is at 0.9D

Open Calculator

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

ex $$5.517241\text{m} = \frac{1.6\text{m}}{0.29}$$

10) Discharge through Channels

Open Calculator

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

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

11) Hydraulic Radius in most Efficient channel for Maximum Velocity

Open Calculator

fx $$R_H = 0.6806 \cdot r'$$

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

12) Radius of Section given Depth of flow in Efficient Channel

Open Calculator

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

$$2.738572\text{m} = \frac{5.2\text{m}}{1.8988}$$

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

Open Calculator

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

$$3.198032\text{m} = \frac{5.2\text{m}}{1.626}$$

14) Radius of Section given Depth of Flows in most Efficient Channel

Open Calculator

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

$$2.771855\text{m} = \frac{5.2\text{m}}{1.876}$$

15) Radius of Section given Hydraulic Radius

Open Calculator

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

$$2.79086\text{m} = \frac{1.6\text{m}}{0.5733}$$

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

Open Calculator

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

$$2.350867\text{m} = \frac{1.6\text{m}}{0.6806}$$

17) Side Slope of Channel Bed given Discharge through Channels

Open Calculator

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

$$0.000125 = \frac{16\text{m}}{\frac{\left((25\text{m}^2)^3\right)}{\left(\frac{14\text{m}^3/\text{s}}{40}\right)^2}}$$

18) Wetted Area given Discharge through Channels

Open Calculator

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

$$16.98499\text{m}^2 = \left(\left(\left(\frac{14\text{m}^3/\text{s}}{40}\right)^2\right) \cdot \frac{16\text{m}}{0.0004}\right)^{\frac{1}{3}}$$

19) Wetted Perimeter given Discharge through Channels

Open Calculator

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

ex $$51.02041\text{m} = \frac{\left((25\text{m}^2)^3\right) \cdot 0.0004}{\left(\frac{14\text{m}^3/\text{s}}{40}\right)^2}$$

Rectangular Section

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

Open Calculator

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

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

21) Depth of Flow in Most Efficient Channel for Rectangular Channel

Open Calculator

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

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

22) Hydraulic Radius in most Efficient Open Channel

Open Calculator

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

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

23) Width of Channel given Depth of flow in Most Efficient channels

Open Calculator

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

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

Trapezoidal Section

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

Open Calculator

fx $$d_f = R_H \cdot 2$$

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

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

Open Calculator

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

ex $$3.298821\text{m} = (0.577 \cdot 18.86\text{m}^2)^{\frac{1}{2}}$$

26) Depth of Flow in most Efficient Channel in Trapezoidal Channel

Open Calculator

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

ex $$3.29999\text{m} = \frac{3.8105\text{m}}{\frac{2}{\sqrt{3}}}$$

27) Depth of Flow in most Efficient Channel in Trapezoidal Channel given Channel Slope

Open Calculator

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

ex $$3.298989\text{m} = \frac{3.8105\text{m} \cdot 0.5}{\sqrt{\left((0.577)^2\right) + 1} - 0.577}$$

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

Open Calculator

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

ex $$3.295989\text{m} = 3.8105\text{m} \cdot \frac{0.577}{1 - \left((0.577)^2\right)}$$

29) Hydraulic Radius of Most Efficient Channel

Open Calculator

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

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

30) Side Slope of Section for Depth of Flow is kept Constant

Open Calculator

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

ex $$0.57735 = \frac{1}{\sqrt{3}} \cdot \frac{3.3\text{m}}{3.3\text{m}}$$

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

Open Calculator

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

ex $$0.577413 = 3.3\text{m} \cdot \frac{3.3\text{m}}{18.86\text{m}^2}$$

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

Open Calculator

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

ex $$18.87348\text{m}^2 = 3.3\text{m} \cdot \frac{3.3\text{m}}{0.577}$$

33) Width of Channel given Depth of Flow in Efficient Channel

Open Calculator

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

ex $$3.811668\text{m} = \left(\sqrt{\left((0.577)^2\right) + 1}\right) \cdot 2 \cdot 3.3\text{m} - 2 \cdot 3.3\text{m} \cdot 0.577$$

34) Width of Channel in most Efficient Channel sections

Open Calculator

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

ex $$3.810512\text{m} = \left(\frac{2}{\sqrt{3}}\right) \cdot 3.3\text{m}$$

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

Open Calculator

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

ex $$3.815137\text{m} = 3.3\text{m} \cdot \left(\frac{1 - \left((0.577)^2 \right)}{0.577} \right)$$

36) Width of Channel in most Efficient Channels section

Open Calculator

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

ex $$3.810512\text{m} = \left(\frac{2}{\sqrt{3}} \right) \cdot 3.3\text{m}$$

Triangular Section

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

Open Calculator

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

ex $$3.300774\text{m} = 1.167\text{m} \cdot \left(2 \cdot \sqrt{2} \right)$$

38) Hydraulic Radius in Efficient channel

Open Calculator

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

ex $$1.177333\text{m} = \frac{3.33\text{m}}{2 \cdot \sqrt{2}}$$

Variables Used

- **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

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

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