

Important Discharge Measurements Formulas PDF



Formulas Examples with Units

List of 10 Important Discharge Measurements Formulas

1) Measurement Methods Formulas

1.1) Mean River Velocity in Float Method Formula

Formula

$$v = 0.85 \cdot v_{\text{surface}}$$

Example with Units

$$2.227 \text{ m/s} = 0.85 \cdot 2.62 \text{ m/s}$$

Evaluate Formula

1.2) Surface Velocity of River in Float Method Formula

Formula

$$v_{\text{surface}} = \frac{v}{0.85}$$

Example with Units

$$2.62 \text{ m/s} = \frac{2.227 \text{ m/s}}{0.85}$$

Evaluate Formula

1.3) Manning's Equation Formulas

1.3.1) Hydraulic radius in Manning's formula Formula

Formula

$$r_H = \frac{A}{P}$$

Example with Units

$$0.15 \text{ m} = \frac{12.0 \text{ m}^2}{80 \text{ m}}$$

Evaluate Formula

1.3.2) Hydraulic Radius using Manning Equation Formula

Formula

$$r_H = \left(\frac{v \cdot n}{S^{\frac{1}{2}}} \right)^{\frac{3}{2}}$$

Example with Units

$$0.3107 \text{ m} = \left(\frac{2.227 \text{ m/s} \cdot 0.412}{4.0^{\frac{1}{2}}} \right)^{\frac{3}{2}}$$

Evaluate Formula

1.3.3) Manning's Equation Formula

Formula

$$v = \left(\frac{1}{n} \right) \cdot (r_H)^{\frac{2}{3}} \cdot (S)^{\frac{1}{2}}$$

Example with Units

$$1.8223 \text{ m/s} = \left(\frac{1}{0.412} \right) \cdot (0.23 \text{ m})^{\frac{2}{3}} \cdot (4.0)^{\frac{1}{2}}$$

Evaluate Formula



1.3.4) Slope of Gradient of Stream Bed given Discharge in Manning's Equation Formula

Formula

$$S = \left(\frac{v \cdot n}{r_H^{\frac{2}{3}}} \right)^2$$

Example with Units

$$5.974 = \left(\frac{2.227 \text{ m/s} \cdot 0.412}{0.23 \text{ m}^{\frac{2}{3}}} \right)^2$$

Evaluate Formula 

1.4) Tracer Method (Instantaneous Injection) Formulas

1.4.1) Estimated Distance given Channel Width Formula

Formula

$$L = \frac{100 \cdot W^2}{d}$$

Example with Units

$$51.8135 \text{ m} = \frac{100 \cdot 10 \text{ m}^2}{193 \text{ m}}$$

Evaluate Formula 

1.4.2) Estimated Distance given Discharge in Tracer Method Formula

Formula

$$L = 50 \cdot \sqrt{Q}$$

Example with Units

$$52.4404 \text{ m} = 50 \cdot \sqrt{1.1 \text{ m}^3/\text{s}}$$

Evaluate Formula 

1.4.3) Water Table Depth given Distance in Tracer Method Formula

Formula

$$d = \frac{100 \cdot W^2}{L}$$

Example with Units

$$192.3077 \text{ m} = \frac{100 \cdot 10 \text{ m}^2}{52 \text{ m}}$$

Evaluate Formula 

1.5) Water Height Relationships Formulas

1.5.1) Water Depth given Flow Velocity in Continuous Discharge Measurements Formula

Formula

$$d = \left(\frac{v}{0.00198} \right)^{\frac{1}{1.3597}} + 17.7$$

Example with Units

$$193.0549 \text{ m} = \left(\frac{2.227 \text{ m/s}}{0.00198} \right)^{\frac{1}{1.3597}} + 17.7$$

Evaluate Formula 



Variables used in list of Discharge Measurements Formulas above

- **A** Cross-Sectional Area (Square Meter)
- **d** Water Depth as Indicated by the Scale (Meter)
- **L** Estimated Distance (Meter)
- **n** Manning's Roughness Coefficient
- **P** Wetted Perimeter (Meter)
- **Q** Discharge (Cubic Meter per Second)
- **r_H** Hydraulic Radius (Meter)
- **S** Bed Slope
- **v** Stream Velocity (Meter per Second)
- **v_{surface}** Flow Velocity at the Surface (Meter per Second)
- **W** Channel Width (Meter)

Constants, Functions, Measurements used in list of Discharge Measurements 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:** **Speed** in Meter per Second (m/s)
Speed Unit Conversion 
- **Measurement:** **Volumetric Flow Rate** in Cubic Meter per Second (m³/s)
Volumetric Flow Rate Unit Conversion 



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