

Important Roughness Coefficient Formulas PDF



**Formulas
Examples
with Units**

List of 12 Important Roughness Coefficient Formulas

1) Roughness Coefficient for Full Flow Formulas

1.1) Roughness Coefficient for Full Flow given Discharge Ratio Formula

Formula

$$N = n_p \cdot \left(\frac{qsQ_{ratio}}{\left(\frac{a}{A}\right) \cdot \left(\frac{r_{pf}}{R_{rf}}\right)^{\frac{1}{6}}} \right)$$

Example with Units

$$0.7377 = 0.9 \cdot \left(\frac{0.532}{\left(\frac{3.8\text{m}^2}{5.4\text{m}^2}\right) \cdot \left(\frac{3.2\text{m}}{5.2\text{m}}\right)^{\frac{1}{6}}} \right)$$

Evaluate Formula

1.2) Roughness Coefficient for Full Flow given Hydraulic Mean Depth and Discharge Ratio Formula

Formula

$$N = n_p \cdot \left(\frac{qsQ_{ratio}}{\left(\frac{a}{A}\right) \cdot (R)^{\frac{1}{6}}} \right)$$

Example with Units

$$0.7388 = 0.9 \cdot \left(\frac{0.532}{\left(\frac{3.8\text{m}^2}{5.4\text{m}^2}\right) \cdot (0.61)^{\frac{1}{6}}} \right)$$

Evaluate Formula

1.3) Roughness Coefficient for Full Flow given Hydraulic Mean Depth and Velocity Ratio Formula

Formula

$$N = \left(\frac{vsV_{ratio}}{(R)^{\frac{1}{6}}} \right) \cdot n_p$$

Example

$$0.7427 = \left(\frac{0.76}{(0.61)^{\frac{1}{6}}} \right) \cdot 0.9$$

Evaluate Formula

1.4) Roughness Coefficient for Full Flow given Hydraulic Mean Depth Ratio Formula

Formula

$$N = \left(\frac{\left(\frac{V_s}{V}\right)}{(R)^{\frac{1}{6}}} \right) \cdot n_p$$

Example with Units

$$0.748 = \left(\frac{\left(\frac{4.6\text{m/s}}{6.01\text{m/s}}\right)}{(0.61)^{\frac{1}{6}}} \right) \cdot 0.9$$

Evaluate Formula



1.5) Roughness Coefficient for Full Flow given Self Cleansing Velocity Formula

Formula

$$N = n_p \cdot \left(\frac{\frac{V_s}{V}}{\left(\frac{r_{pf}}{R_{rf}} \right)^{\frac{2}{3}} \cdot \sqrt{S}} \right)$$

Example with Units

$$0.7097 = 0.9 \cdot \left(\frac{\frac{4.6 \text{ m/s}}{6.01 \text{ m/s}}}{\left(\frac{3.2 \text{ m}}{5.2 \text{ m}} \right)^{\frac{2}{3}} \cdot \sqrt{1.8}} \right)$$

Evaluate Formula 

1.6) Roughness Coefficient for Full Flow given Velocity Ratio Formula

Formula

$$N = n_p \cdot \left(\frac{vsV_{ratio}}{\left(\frac{r_{pf}}{R_{rf}} \right)^{\frac{2}{3}} \cdot \sqrt{S}} \right)$$

Example with Units

$$0.7047 = 0.9 \cdot \left(\frac{0.76}{\left(\frac{3.2 \text{ m}}{5.2 \text{ m}} \right)^{\frac{2}{3}} \cdot \sqrt{1.8}} \right)$$

Evaluate Formula 

2) Roughness Coefficient for Partial Flow Formulas

2.1) Roughness Coefficient for Partial Flow given Discharge Ratio Formula

Formula

$$n_p = \frac{N}{\frac{qsQ_{ratio}}{\left(\frac{a}{A} \right) \cdot \left(\frac{r_{pf}}{R_{rf}} \right)^{\frac{1}{6}}}}$$

Example with Units

$$0.9028 = \frac{0.74}{\frac{0.532}{\left(\frac{3.8 \text{ m}^2}{5.4 \text{ m}^2} \right) \cdot \left(\frac{3.2 \text{ m}}{5.2 \text{ m}} \right)^{\frac{1}{6}}}}$$

Evaluate Formula 

2.2) Roughness Coefficient for Partial Flow given Hydraulic Mean Depth and Discharge Ratio Formula

Formula

$$n_p = \frac{N}{\frac{qsQ_{ratio}}{\left(\frac{a}{A} \right) \cdot (R)^{\frac{1}{6}}}}$$

Example with Units

$$0.9014 = \frac{0.74}{\frac{0.532}{\left(\frac{3.8 \text{ m}^2}{5.4 \text{ m}^2} \right) \cdot (0.61)^{\frac{1}{6}}}}$$

Evaluate Formula 

2.3) Roughness Coefficient for Partial Flow given Hydraulic Mean Depth and Velocity Ratio Formula

Formula

$$n_p = \frac{N}{\frac{vsV_{ratio}}{(R)^{\frac{1}{6}}}}$$

Example

$$0.8967 = \frac{0.74}{(0.61)^{\frac{1}{6}}}$$

Evaluate Formula 



2.4) Roughness Coefficient for Partial Flow given Hydraulic Mean Depth Ratio Formula

Formula

$$n_p = \frac{N}{\frac{V_s}{V} \cdot \left(\frac{R}{R_{ft}}\right)^{\frac{1}{6}}}$$

Example with Units

$$0.8904 = \frac{0.74}{\frac{4.6 \text{ m/s}}{6.01 \text{ m/s}} \cdot (0.61)^{\frac{1}{6}}}$$

Evaluate Formula 

2.5) Roughness Coefficient for Partial Flow given Self Cleansing Velocity Formula

Formula

$$n_p = \frac{N}{\frac{V_s}{V} \cdot \left(\frac{r_{pt}}{R_{ft}}\right)^{\frac{2}{3}} \cdot \sqrt{S}}$$

Example with Units

$$0.9385 = \frac{0.74}{\frac{4.6 \text{ m/s}}{6.01 \text{ m/s}} \cdot \left(\frac{3.2 \text{ m}}{5.2 \text{ m}}\right)^{\frac{2}{3}} \cdot \sqrt{1.8}}$$

Evaluate Formula 

2.6) Roughness Coefficient for Partial Flow given Velocity Ratio Formula

Formula

$$n_p = \frac{N}{\frac{v_{s \text{ ratio}}}{V} \cdot \left(\frac{r_{pt}}{R_{ft}}\right)^{\frac{2}{3}} \cdot \sqrt{S}}$$

Example with Units

$$0.9451 = \frac{0.74}{\frac{0.76}{V} \cdot \left(\frac{3.2 \text{ m}}{5.2 \text{ m}}\right)^{\frac{2}{3}} \cdot \sqrt{1.8}}$$




Evaluate Formula 



Variables used in list of Roughness Coefficient Formulas above






- **a** Area of Partially Full Sewers (Square Meter)
- **A** Area of Running Full Sewers (Square Meter)
- **N** Roughness Coefficient for Running Full
- n_p Roughness Coefficient Partially Full
- qsQ_{ratio} Discharge Ratio
- **R** Hydraulic Mean Depth Ratio
- r_{pf} Hydraulic Mean Depth for Partially Full (Meter)
- R_{rf} Hydraulic Mean Depth while Running Full (Meter)
- **S** Bed Slope Ratio
- **V** Velocity While Running Full (Meter per Second)
- V_s Velocity in a Partially Running Sewer (Meter per Second)
- vsV_{ratio} Velocity Ratio

Constants, Functions, Measurements used in list of Roughness Coefficient Formulas above

- **Functions:** **sqrt**, $\text{sqrt}(\text{Number})$
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 (m^2)
Area Unit Conversion 
- **Measurement:** **Speed** in Meter per Second (m/s)
Speed Unit Conversion 



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