



# **Manning's Formula Formulas**

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# **List of 18 Manning's Formula Formulas**

# Manning's Formula 🗗

1) Diameter of Pipe given Head loss by Manning Formula 🗗



Open Calculator

Open Calculator 2

 $\mathbf{E} D_{\mathrm{p}} = \left(rac{\mathrm{Lp} \cdot \left(\mathrm{n} \cdot \mathrm{v_{\mathrm{f}}}
ight)^{2}}{0.157 \cdot \mathrm{h_{\mathrm{f}}}}
ight)^{4}$ 

2) Diameter of Pipe given Velocity of Flow in Pipe by Manning Formula 🗲

$$\mathbf{f}$$
  $D_{p} = \left(rac{v_{\mathrm{f}} \cdot n}{0.397 \cdot \left(S^{rac{1}{2}}
ight)}
ight)^{rac{1}{2}}$ 

ex 
$$0.399319 \mathrm{m} = \left( \frac{11.96 \mathrm{m/s} \cdot 0.009}{0.397 \cdot \left( (0.25)^{\frac{1}{2}} \right)} \right)^{\frac{3}{2}}$$



#### 3) Head loss by Manning Formula

 $\mathbf{h}_{\mathrm{f}} = rac{\mathrm{Lp}_{\cdot} \cdot \left(\mathrm{n} \cdot \mathrm{v}_{\mathrm{f}}
ight)^{2}}{0.157 \cdot \left(\mathrm{D}_{\mathrm{p}}
ight)^{rac{4}{3}}}$ 

Open Calculator 🚰

 $= \frac{4.90 \text{m} \cdot (0.009 \cdot 11.96 \text{m/s})^2}{0.157 \cdot (0.4 \text{m})^{\frac{4}{3}} }$ 

### 4) Head loss by Manning Formula given Radius of Pipe

 $\mathbf{h}_{\mathrm{f}} = rac{\mathrm{Lp}, \cdot \left( \mathrm{n} \cdot \mathrm{v}_{\mathrm{f}} 
ight)^2}{0.157 \cdot \left( 2 \cdot \mathrm{R} 
ight)^{rac{4}{3}}}$ 

Open Calculator

 $= 1.22696 \text{m} = \frac{4.90 \text{m} \cdot (0.009 \cdot 11.96 \text{m/s})^2}{0.157 \cdot (2 \cdot 200 \text{mm})^{\frac{4}{3}} }$ 

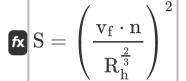
# 5) Hydraulic Gradient by Manning Formula given Diameter

 $\left|\mathbf{S}
ight| \mathbf{S} = \left(rac{v_f \cdot n}{0.397 \cdot \left(D_p^{rac{2}{3}}
ight)}
ight)^2$ 

Open Calculator 🗗



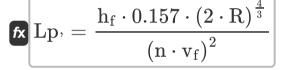
# 6) Hydraulic Gradient given Velocity of Flow in Pipe by Manning Formula



Open Calculator 🗗

ex 
$$0.249621 = \left( \frac{11.96 \mathrm{m/s} \cdot 0.009}{(0.10 \mathrm{m})^{\frac{2}{3}}} \right)^2$$

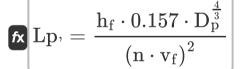
### 7) Length of Pipe by Manning Formula given Radius of Pipe



Open Calculator 🗗

$$= \frac{1.2 \text{m} \cdot 0.157 \cdot (2 \cdot 200 \text{mm})^{\frac{4}{3}}}{(0.009 \cdot 11.96 \text{m/s})^2}$$

# 8) Length of Pipe given Head loss by Manning Formula



Open Calculator 🗗

ex 
$$4.792331 \text{m} = \frac{1.2 \text{m} \cdot 0.157 \cdot (0.4 \text{m})^{\frac{4}{3}}}{(0.009 \cdot 11.96 \text{m/s})^2}$$



### 9) Manning's Coefficient by Manning Formula given Radius of Pipe

 $\left| \mathbf{fx} 
ight| n = \sqrt{rac{ h_f \cdot 0.157 \cdot \left( 2 \cdot R 
ight)^{rac{4}{3}}}{ Lp^, \cdot v_f^2}}$ 

Open Calculator 🚰

 $oxed{ex} 0.008901 = \sqrt{rac{1.2 ext{m} \cdot 0.157 \cdot (2 \cdot 200 ext{mm})^{rac{4}{3}}}{4.90 ext{m} \cdot (11.96 ext{m/s})^2}}$ 

### 10) Manning's Coefficient given Diameter of Pipe

 $\mathbf{n} = \left(rac{0.397}{v_{
m f}}
ight) \cdot \left(D_{
m p}^{rac{2}{3}}
ight) \cdot \left(S^{rac{1}{2}}
ight)$ 

Open Calculator 🗗

 $\boxed{ 0.00901 = \left( \frac{0.397}{11.96 \mathrm{m/s}} \right) \cdot \left( (0.4 \mathrm{m})^{\frac{2}{3}} \right) \cdot \left( (0.25)^{\frac{1}{2}} \right) }$ 

# 11) Manning's Coefficient given Head loss by Manning Formula

 $\left| \mathbf{f} \mathbf{x} 
ight| n = \sqrt{\left| rac{\mathbf{h}_{\mathrm{f}} \cdot 0.157 \cdot D_{\mathrm{p}}^{rac{4}{3}}}{\mathbf{L} \mathbf{p}, \cdot \mathbf{v}_{\mathrm{f}}^{2}} 
ight|}$ 

Open Calculator

ex  $0.008901 = \sqrt{\frac{1.2 \mathrm{m} \cdot 0.157 \cdot (0.4 \mathrm{m})^{\frac{4}{3}}}{4.90 \mathrm{m} \cdot (11.96 \mathrm{m/s})^2}}$ 

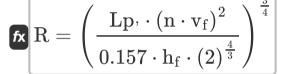


#### 12) Manning's Coefficient given Velocity of Flow

 $\mathbf{r} = rac{\left(\mathrm{R}_\mathrm{h}^{rac{2}{3}}
ight)\cdot\left(\mathrm{S}^{rac{1}{2}}
ight)}{\mathrm{v}_\mathrm{f}}$ 

Open Calculator 🖸

#### 13) Radius of Pipe given Head loss by Manning Formula



Open Calculator 🗗

 $\mathbf{ex} \ 203.3607 \mathrm{mm} = \left( \frac{4.90 \mathrm{m} \cdot (0.009 \cdot 11.96 \mathrm{m/s})^2}{0.157 \cdot 1.2 \mathrm{m} \cdot (2)^{\frac{4}{3}}} \right)^{\frac{3}{4}}$ 

### 14) Radius of Pipe given Velocity of Flow in Pipe by Manning Formula

$$R_{
m h} = \left(rac{{
m v_f}\cdot{
m n}}{{
m g}^{rac{1}{2}}}
ight)^{rac{3}{2}}$$

Open Calculator

ex 
$$0.099886 \mathrm{m} = \left(rac{11.96 \mathrm{m/s} \cdot 0.009}{(0.25)^{rac{1}{2}}}
ight)^{rac{3}{2}}$$



### 15) Velocity of Flow in Pipe by Manning Formula 🖒

 $\left|\mathbf{r} \mathbf{r} \right| v_f = \left(rac{1}{n}
ight) \cdot \left(R_h^{rac{2}{3}}
ight) \cdot \left(S^{rac{1}{2}}
ight)$ 

Open Calculator 🗗

ex  $11.96908 \text{m/s} = \left(\frac{1}{0.009}\right) \cdot \left((0.10 \text{m})^{\frac{2}{3}}\right) \cdot \left((0.25)^{\frac{1}{2}}\right)$ 

# 16) Velocity of Flow in Pipe by Manning Formula given Diameter

 $\left|\mathbf{r}_{\mathrm{f}}\right|v_{\mathrm{f}}=\left(rac{0.397}{n}
ight)\cdot\left(D_{p}^{rac{2}{3}}
ight)\cdot\left(S^{rac{1}{2}}
ight)$ 

Open Calculator 🗗

ex  $11.9736 \mathrm{m/s} = \left(\frac{0.397}{0.009}\right) \cdot \left((0.4 \mathrm{m})^{\frac{2}{3}}\right) \cdot \left((0.25)^{\frac{1}{2}}\right)$ 

# 17) Velocity of Flow in Pipe by Manning Formula given Radius of Pipe 🚰

 $\left| \mathbf{r_f} 
ight| v_f = \sqrt{rac{\mathbf{h_f} \cdot 0.157 \cdot (2 \cdot R)^{rac{4}{3}}}{\mathbf{Lp}, \cdot \mathbf{n}^2}}$ 

Open Calculator 🗗

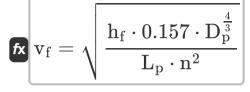
ex  $11.82787 \mathrm{m/s} = \sqrt{\frac{1.2 \mathrm{m} \cdot 0.157 \cdot (2 \cdot 200 \mathrm{mm})^{\frac{4}{3}}}{4.90 \mathrm{m} \cdot (0.009)^2}}$ 



### 18) Velocity of Flow in Pipe given Head loss by Manning Formula 🗗



Open Calculator 2



ex 
$$16.55902 \mathrm{m/s} = \sqrt{\frac{1.2 \mathrm{m} \cdot 0.157 \cdot (0.4 \mathrm{m})^{\frac{4}{3}}}{2.5 \mathrm{m} \cdot (0.009)^2}}$$



#### Variables Used

- **D**<sub>p</sub> Diameter of Pipe (Meter)
- **h**f Head Loss (Meter)
- L<sub>p</sub> Length of Pipe (Meter)
- Lp. Pipe Length (Meter)
- n Manning Coefficient
- R Pipe Radius (Millimeter)
- R<sub>h</sub> Hydraulic Radius (Meter)
- S Hydraulic Gradient
- V<sub>f</sub> Flow Velocity (Meter per Second)



## 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), Millimeter (mm)

  Length Unit Conversion
- Measurement: Speed in Meter per Second (m/s)
   Speed Unit Conversion





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- Darcy's Weisbach Equation
   Formulas
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   Formulas
- 🔹 Manning's Formula Formulas 🚰

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