



Proportionate Hydraulic Elements for Circular Sewers Formulas

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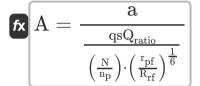


List of 27 Proportionate Hydraulic Elements for Circular Sewers Formulas

Proportionate Hydraulic Elements for Circular Sewers 🗗

Area of Cross Section of Circular Sewer

1) Area of Cross-section for Full Flow given Discharge Ratio



Open Calculator 🗗

$$= \frac{3.8 \text{m}^2}{\frac{0.532}{\left(\frac{0.74}{0.9}\right) \cdot \left(\frac{3.2 \text{m}}{5.2 \text{m}}\right)^{\frac{1}{6}}} }$$

2) Area of Cross-section for Full Flow given Hydraulic Mean Depth and Discharge Ratio

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

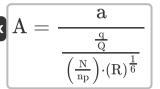
$$ext{ex} egin{array}{c} 5.408574 ext{m}^2 = rac{3.8 ext{m}^2}{0.532} \ rac{\left(rac{0.74}{0.9}
ight) \cdot \left(0.61
ight)^{rac{1}{6}}}{} \end{array}$$





3) Area of Cross-Section for Full Flow given Hydraulic Mean Depth Ratio

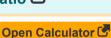




Open Calculator 🗗

$$ext{ex} egin{array}{c} 5.349786 ext{m}^2 = rac{3.8 ext{m}^2}{rac{17.48 ext{m}^2/ ext{s}}{32.5 ext{m}^2/ ext{s}}} \ \hline ig(rac{0.74}{0.9}ig)\cdot (0.61)^{rac{1}{6}} \end{array}$$

4) Area of Cross-Section for Partial Flow given Discharge Ratio



$$\mathbf{fx} = \mathbf{A} \cdot \left(rac{qsQ_{ratio}}{\left(rac{N}{n_p}
ight) \cdot \left(rac{r_{pf}}{R_{rf}}
ight)^{rac{1}{6}}}
ight)$$

$$oxed{ex} 3.788423 \mathrm{m}^2 = 5.4 \mathrm{m}^2 \cdot \left(rac{0.532}{\left(rac{0.74}{0.9}
ight) \cdot \left(rac{3.2 \mathrm{m}}{5.2 \mathrm{m}}
ight)^{rac{1}{6}}}
ight)$$





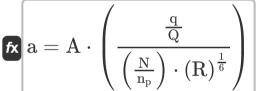
5) Area of Cross-section for Partial Flow given Hydraulic Mean Depth and Discharge Ratio

 \mathbf{f} $\mathbf{a} = \mathbf{A} \cdot \left(rac{\mathrm{qsQ_{ratio}}}{\left(rac{\mathrm{N}}{2}
ight) \cdot \left(\mathrm{R}
ight)^{rac{1}{6}}}
ight)$

Open Calculator 2

$$oxed{\mathbf{ex}} 3.793976 \mathrm{m}^{2} = 5.4 \mathrm{m}^{2} \cdot \left(rac{0.532}{\left(rac{0.74}{0.9}
ight) \cdot \left(0.61
ight)^{rac{1}{6}}}
ight)$$

6) Area of Cross-Section for Partial Flow given Hydraulic Mean Depth Ratio



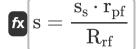
ex
$$3.835668 \mathrm{m}^2 = 5.4 \mathrm{m}^2 \cdot \left(rac{rac{17.48 \mathrm{m}^3/\mathrm{s}}{32.5 \mathrm{m}^3/\mathrm{s}}}{\left(rac{0.74}{0.9}
ight) \cdot \left(0.61
ight)^{rac{1}{6}}}
ight)$$





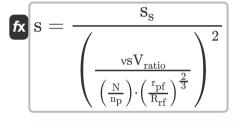
Bed Slope of Circular Sewer 🗗

7) Bed Slope for Full Flow given Bed Slope for Partial Flow



Open Calculator

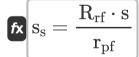
8) Bed Slope for Full Flow given Velocity Ratio



Open Calculator

$$ex 0.001103 = \frac{0.0018}{\left(\frac{0.76}{\left(\frac{0.74}{0.9}\right) \cdot \left(\frac{3.2m}{5.2m}\right)^{\frac{2}{3}}}\right)^2}$$

9) Bed Slope for Partial Flow



$$oxed{ex} 0.001625 = rac{5.2 ext{m} \cdot 0.001}{3.2 ext{m}}$$





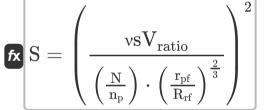
10) Bed Slope for Partial Flow given Velocity Ratio

Open Calculator

 $\left| \mathbf{f}_{\mathbf{s}}
ight| \mathbf{s}_{\mathrm{s}} = \mathbf{s} \cdot \left(\left. rac{\mathrm{vsV}_{\mathrm{ratio}}}{\left(rac{\mathrm{N}}{2}
ight) \cdot \left(rac{\mathrm{r}_{\mathrm{pf}}}{2}
ight)^{rac{2}{3}}}
ight)^{2}$

ex $0.001632 = 0.001 \cdot \left(\frac{0.76}{\left(\frac{0.74}{2.2} \right) \cdot \left(\frac{3.2m}{5.2} \right)^{\frac{2}{3}}} \right)^2$

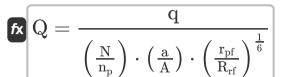
11) Ratio of Bed Slope given Velocity Ratio



ex $1.63225 = \left(\frac{0.76}{\left(\frac{0.74}{2.5}\right) \cdot \left(\frac{3.2 \text{m}}{3}\right)^{\frac{2}{3}}}\right)^2$

Discharge and Discharge Ratio through Circular Sewer

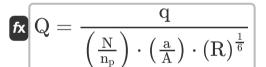
12) Discharge of Full Flow given Hydraulic Mean Depth for Partial flow



Open Calculator

 $\frac{32.75704 \text{m}^3/\text{s}}{\left(\frac{0.74}{0.9}\right) \cdot \left(\frac{3.8 \text{m}^2}{5.4 \text{m}^2}\right) \cdot \left(\frac{3.2 \text{m}}{5.2 \text{m}}\right)^{\frac{1}{6}} }$

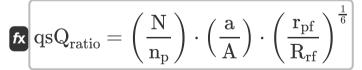
13) Discharge of Full Flow given Hydraulic Mean Depth Ratio



Open Calculator

 $= \frac{32.80505 \mathrm{m}^3/\mathrm{s}}{\left(\frac{0.74}{0.9}\right) \cdot \left(\frac{3.8 \mathrm{m}^2}{5.4 \mathrm{m}^2}\right) \cdot \left(0.61\right)^{\frac{1}{6}} }$

14) Discharge Ratio given Hydraulic Mean Depth for Full Flow



Open Calculator





15) Discharge Ratio given Hydraulic Mean Depth Ratio

 $\left| \mathbf{r} \mathbf{q} \mathbf{s} \mathbf{Q}_{\mathrm{ratio}} = \left(rac{N}{n_{\mathrm{D}}}
ight) \cdot \left(rac{\mathbf{a}}{A}
ight) \cdot (R)^{rac{1}{6}}
ight|$

Open Calculator 🗗

 $oxed{ex} 0.532845 = \left(rac{0.74}{0.9}
ight) \cdot \left(rac{3.8 \mathrm{m}^2}{5.4 \mathrm{m}^2}
ight) \cdot (0.61)^{rac{1}{6}}$

16) Self Cleansing Discharge given Hydraulic Mean Depth for Full Flow

 $\mathbf{f}\mathbf{x} = \mathrm{Q} \cdot \left(\left(rac{\mathrm{N}}{\mathrm{n_p}}
ight) \cdot \left(rac{\mathrm{a}}{\mathrm{A}}
ight) \cdot \left(rac{\mathrm{r_{pf}}}{\mathrm{R_{rf}}}
ight)^{rac{1}{6}}
ight)$

Open Calculator

 $= 17.34284 \mathrm{m}^3/\mathrm{s} = 32.5 \mathrm{m}^3/\mathrm{s} \cdot \left(\left(\frac{0.74}{0.9} \right) \cdot \left(\frac{3.8 \mathrm{m}^2}{5.4 \mathrm{m}^2} \right) \cdot \left(\frac{3.2 \mathrm{m}}{5.2 \mathrm{m}} \right)^{\frac{1}{6}} \right)$

17) Self Cleansing Discharge given Hydraulic Mean Depth Ratio

 $\mathbf{f} \mathbf{x} = \mathbf{Q} \cdot \left(\left(\frac{\mathbf{N}}{\mathbf{n}_{\mathbf{p}}} \right) \cdot \left(\frac{\mathbf{a}}{\mathbf{A}} \right) \cdot (\mathbf{R})^{\frac{1}{6}} \right)$

Open Calculator 🔄

 $ext{ex} 17.31745 ext{m}^3/ ext{s} = 32.5 ext{m}^3/ ext{s} \cdot \left(\left(rac{0.74}{0.9}
ight) \cdot \left(rac{3.8 ext{m}^2}{5.4 ext{m}^2}
ight) \cdot (0.61)^{rac{1}{6}}
ight)$





Flow Velocity through Circular Sewer

18) Self Cleansing Velocity given Bed Slope for Partial Flow

 $V_{
m s} = V \cdot \left(\left(rac{
m N}{
m n_p}
ight) \cdot \left(rac{
m r_{
m pf}}{
m R_{
m rf}}
ight)^{rac{2}{3}} \cdot \sqrt{rac{
m s_s}{
m s}}
ight)^{-1}$

Open Calculator

19) Self Cleansing Velocity given Hydraulic Mean Depth for Full Flow

 $extbf{K} V_{
m s} = V \cdot \left(rac{
m N}{
m n_{
m n}}
ight) \cdot \left(rac{
m r_{
m pf}}{
m R_{
m ef}}
ight)^{rac{1}{6}}$

Open Calculator 🗗

ex $4.557445 \text{m/s} = 6.01 \text{m/s} \cdot \left(\frac{0.74}{0.9}\right) \cdot \left(\frac{3.2 \text{m}}{5.2 \text{m}}\right)^{\frac{1}{6}}$

20) Self Cleansing Velocity given Hydraulic Mean Depth Ratio

 $\left| \mathbf{v}_{\mathrm{s}} \right| V_{\mathrm{s}} = V \cdot \left(rac{N}{n_{\mathrm{p}}}
ight) \cdot (R)^{rac{1}{6}} \, .$

Open Calculator

= $4.550775 ext{m/s} = 6.01 ext{m/s} \cdot \left(rac{0.74}{0.9}
ight) \cdot (0.61)^{rac{1}{6}}$





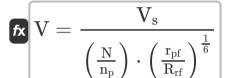
21) Self Cleansing Velocity using Ratio of Bed Slope 🗗

Open Calculator 2

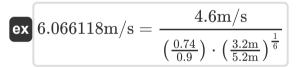
$$V_{
m s} = V \cdot \left(\left(rac{
m N}{
m n_p}
ight) \cdot \left(rac{
m r_{
m pf}}{
m R_{
m rf}}
ight)^{rac{2}{3}} \cdot \sqrt{
m S}
ight)$$

$$= 4.796573 \text{m/s} = 6.01 \text{m/s} \cdot \left(\left(\frac{0.74}{0.9} \right) \cdot \left(\frac{3.2 \text{m}}{5.2 \text{m}} \right)^{\frac{2}{3}} \cdot \sqrt{1.8} \right)$$

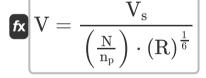
22) Velocity of Full Flow given Hydraulic Mean Depth for Full Flow 🖒



Open Calculator 2



23) Velocity of Full Flow given Hydraulic Mean Depth Ratio 🛂



ex
$$6.07501 \text{m/s} = \frac{4.6 \text{m/s}}{\left(\frac{0.74}{0.9}\right) \cdot (0.61)^{\frac{1}{6}}}$$





24) Velocity Ratio given Hydraulic Mean Depth Ratio 🗗

 $ext{ratio} = \left(\left(rac{N}{n_p}
ight) \cdot (R)^{rac{1}{6}}
ight)$

Open Calculator 🚰

 $oxed{ex} 0.7572 = \left(\left(rac{0.74}{0.9}
ight) \cdot (0.61)^{rac{1}{6}}
ight)$

25) Velocity Ratio given Ratio of Bed Slope

extstyle ext

Open Calculator 🚰

ex $0.798099 = \left(\frac{0.74}{0.9}\right) \cdot \left(\frac{3.2 \mathrm{m}}{5.2 \mathrm{m}}\right)^{\frac{2}{3}} \cdot \sqrt{1.8}$

26) Velocity when Running Full using Bed Slope for Partial Flow

 $V = rac{V_{
m S}}{\left(rac{
m N}{
m n_p}
ight) \cdot \left(rac{
m r_{
m pf}}{
m R_{
m rf}}
ight)^{rac{2}{3}} \cdot \sqrt{rac{
m s_s}{
m s}}}$

Open Calculator

 $= \frac{4.6 \text{m/s}}{\left(\frac{0.74}{0.9}\right) \cdot \left(\frac{3.2 \text{m}}{5.2 \text{m}}\right)^{\frac{2}{3}} \cdot \sqrt{\frac{0.0018}{0.001}} }$



27) Velocity when Running Full using Ratio of Bed Slope 🗗



$$ext{V} = rac{ ext{V}_{ ext{s}}}{\left(rac{ ext{N}}{ ext{n}_{ ext{p}}}
ight) \cdot \left(rac{ ext{r}_{ ext{pf}}}{ ext{R}_{ ext{rf}}}
ight)^{rac{2}{3}} \cdot \sqrt{ ext{S}}}$$

$$= \frac{4.6 \text{m/s}}{\left(\frac{0.74}{0.9}\right) \cdot \left(\frac{3.2 \text{m}}{5.2 \text{m}}\right)^{\frac{2}{3}} \cdot \sqrt{1.8} }$$



Variables Used

- **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
- **Q** Discharge when Pipe is Running Partially Full (Cubic Meter per Second)
- Q Discharge when Pipe is Running Full (Cubic Meter per Second)
- 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 of Channel
- S Bed Slope Ratio
- Ss Bed Slope of Partial Flow
- 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

- 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: 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





Check other formula lists

- Flow Velocity in Sewers and Drains Formulas
- Hydraulic Mean Depth
 Formulas
- Minimum Velocity to be Generated in Sewers Formulas
- Proportionate Hydraulic Elements for Circular Sewers Formulas
- Roughness Coefficient Formulas

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