

Important Geometrical Properties of Circular Channel Section Formulas PDF



Formulas
Examples
with Units

List of 14 Important Geometrical Properties of Circular Channel Section Formulas

1) Angle of Sector given Top Width Formula ↻

Formula

$$\theta_{\text{Angle}} = 2 \cdot \text{asin} \left(\left(\frac{T_{\text{cir}}}{d_{\text{section}}} \right) \right)$$

Example with Units

$$3.1402^\circ = 2 \cdot \text{asin} \left(\left(\frac{0.137 \text{ m}}{5 \text{ m}} \right) \right)$$

Evaluate Formula ↻

2) Angle of Sector given Wetted Perimeter Formula ↻

Formula

$$\theta_{\text{Angle}} = \frac{p}{0.5 \cdot d_{\text{section}}} \cdot \left(\frac{\pi}{180} \right)$$

Example with Units

$$6.4^\circ = \frac{16 \text{ m}}{0.5 \cdot 5 \text{ m}} \cdot \left(\frac{3.1416}{180} \right)$$

Evaluate Formula ↻

3) Diameter of Section given Hydraulic Depth Formula ↻

Formula

$$d_{\text{section}} = \frac{D_{\text{cir}}}{0.125 \cdot \left(\left(\theta_{\text{Angle}} \cdot \left(\frac{180}{\pi} \right) \right) - \frac{\sin \left(\frac{\theta_{\text{Angle}}}{2} \right)}{\sin \left(\frac{\theta_{\text{Angle}}}{2} \right)} \right)}$$

Evaluate Formula ↻

Example with Units

$$5.0002 \text{ m} = \frac{0.713 \text{ m}}{0.125 \cdot \left(\left(3.14^\circ \cdot \left(\frac{180}{3.1416} \right) \right) - \frac{\sin \left(\frac{3.14^\circ}{2} \right)}{\sin \left(\frac{3.14^\circ}{2} \right)} \right)}$$

4) Diameter of Section given Hydraulic Radius for Channel Formula ↻

Formula

$$d_{\text{section}} = \frac{R_{\text{h(cir)}}}{0.25 \cdot \left(1 - \left(\frac{\sin \left(\frac{\theta_{\text{Angle}}}{2} \right)}{\left(\frac{180}{\pi} \right) \cdot \theta_{\text{Angle}}} \right) \right)}$$

Example with Units

$$5.0888 \text{ m} = \frac{1.25 \text{ m}}{0.25 \cdot \left(1 - \left(\frac{\sin \left(\frac{3.14^\circ}{2} \right)}{\left(\frac{180}{3.1416} \right) \cdot 3.14^\circ} \right) \right)}$$

Evaluate Formula ↻



5) Diameter of Section given Section Factor Formula

Formula

Evaluate Formula 

$$d_{\text{section}} = \left(\frac{Z_{\text{cir}}}{\left(\frac{\sqrt{Z}}{32} \right) \cdot \frac{\left(\left(\frac{180}{\pi} \right) \cdot \theta_{\text{Angle}} - \sin \left(\theta_{\text{Angle}} \right) \right)^{1.5}}{\left(\sin \left(\frac{\theta_{\text{Angle}}}{2} \right) \right)^{0.5}}} \right)^{\frac{2}{5}}$$

Example with Units

$$4.9999 \text{ m} = \left(\frac{80.88 \text{ m}^2}{\left(\frac{\sqrt{Z}}{32} \right) \cdot \frac{\left(\left(\frac{180}{3.1416} \right) \cdot 3.14^\circ - \sin \left(3.14^\circ \right) \right)^{1.5}}{\left(\sin \left(\frac{3.14^\circ}{2} \right) \right)^{0.5}}} \right)^{\frac{2}{5}}$$

6) Diameter of Section given Top Width Formula

Formula

Example with Units

Evaluate Formula 

$$d_{\text{section}} = \frac{T_{\text{cir}}}{\sin \left(\frac{\theta_{\text{Angle}}}{2} \right)}$$

$$5.0003 \text{ m} = \frac{0.137 \text{ m}}{\sin \left(\frac{3.14^\circ}{2} \right)}$$

7) Diameter of Section given Wetted Area Formula

Formula

Evaluate Formula 

$$d_{\text{section}} = \sqrt{\frac{\left(\frac{180}{\pi} \right) \cdot \left(\theta_{\text{Angle}} \right) - \left(8 \cdot A_{\text{w(cir)}} \right)}{\sin \left(\theta_{\text{Angle}} \right)}}$$

Example with Units

$$5.0047 \text{ m} = \sqrt{\frac{\left(\frac{180}{3.1416} \right) \cdot \left(3.14^\circ \right) - \left(8 \cdot 0.221 \text{ m}^2 \right)}{\sin \left(3.14^\circ \right)}}$$

8) Diameter of Section given Wetted Perimeter Formula

Formula

Example with Units

Evaluate Formula 

$$d_{\text{section}} = \frac{p}{0.5 \cdot \theta_{\text{Angle}} \cdot \left(\frac{180}{\pi} \right)}$$

$$10.1911 \text{ m} = \frac{16 \text{ m}}{0.5 \cdot 3.14^\circ \cdot \left(\frac{180}{3.1416} \right)}$$



9) Hydraulic Depth of Circle Formula

Formula

$$D_{\text{cir}} = (d_{\text{section}} \cdot 0.125) \cdot \left(\left(\frac{180}{\pi} \right) \cdot \theta_{\text{Angle}} - \frac{\sin\left(\frac{\theta_{\text{Angle}}}{2}\right)}{\sin\left(\frac{\theta_{\text{Angle}}}{2}\right)} \right)$$

Evaluate Formula 

Example with Units

$$0.713 \text{ m} = (5 \text{ m} \cdot 0.125) \cdot \left(\left(\frac{180}{3.1416} \right) \cdot 3.14^\circ - \frac{\sin\left(\frac{3.14^\circ}{2}\right)}{\sin\left(\frac{3.14^\circ}{2}\right)} \right)$$

10) Hydraulic Radius given Angle Formula

Formula

$$R_{h(\text{cir})} = 0.25 \cdot d_{\text{section}} \cdot \left(1 - \frac{\sin\left(\frac{\theta_{\text{Angle}}}{2}\right)}{\frac{180}{\pi}} \cdot \theta_{\text{Angle}} \right)$$

Evaluate Formula 

Example with Units

$$1.2499 \text{ m} = 0.25 \cdot 5 \text{ m} \cdot \left(1 - \frac{\sin\left(\frac{3.14^\circ}{2}\right)}{\frac{180}{3.1416}} \cdot 3.14^\circ \right)$$

11) Section Factor for Circle Formula

Formula

$$Z_{\text{cir}} = \left(\left(\frac{\sqrt{Z}}{32} \right) \cdot (d_{\text{section}})^{2.5} \cdot \frac{\left(\left(\frac{180}{\pi} \right) \cdot \theta_{\text{Angle}} - \sin\left(\frac{\theta_{\text{Angle}}}{2}\right) \right)^{1.5}}{\left(\sin\left(\frac{\theta_{\text{Angle}}}{2}\right) \right)^{0.5}} \right)$$

Evaluate Formula 

Example with Units

$$80.8833 \text{ m}^{2.5} = \left(\left(\frac{\sqrt{Z}}{32} \right) \cdot (5 \text{ m})^{2.5} \cdot \frac{\left(\left(\frac{180}{3.1416} \right) \cdot 3.14^\circ - \sin\left(\frac{3.14^\circ}{2}\right) \right)^{1.5}}{\left(\sin\left(\frac{3.14^\circ}{2}\right) \right)^{0.5}} \right)$$

12) Top Width for Circle Formula

Formula

$$T_{\text{cir}} = d_{\text{section}} \cdot \sin\left(\frac{\theta_{\text{Angle}}}{2}\right)$$

Example with Units

$$0.137 \text{ m} = 5 \text{ m} \cdot \sin\left(\frac{3.14^\circ}{2}\right)$$

Evaluate Formula 



13) Wetted Area for Circle Formula

Formula

Evaluate Formula 

$$A_{w(cir)} = \left(\frac{1}{8} \right) \cdot \left(\left(\frac{180}{\pi} \right) \cdot \theta_{Angle} - \sin(\theta_{Angle}) \cdot (d_{section}^2) \right)$$

Example with Units

$$0.2213 m^2 = \left(\frac{1}{8} \right) \cdot \left(\left(\frac{180}{3.1416} \right) \cdot 3.14^\circ - \sin(3.14^\circ) \cdot (5 m^2) \right)$$

14) Wetted Perimeter for circle Formula

Formula

Example with Units

Evaluate Formula 

$$p = 0.5 \cdot \theta_{Angle} \cdot d_{section} \cdot \frac{180}{\pi}$$

$$7.85 m = 0.5 \cdot 3.14^\circ \cdot 5 m \cdot \frac{180}{3.1416}$$



Variables used in list of Geometrical Properties of Circular Channel Section Formulas above

- **$A_{w(cir)}$** Wetted Surface Area of Circular Channel (Square Meter)
- **D_{cir}** Hydraulic Depth of Circular Channel (Meter)
- **$d_{section}$** Diameter of Section (Meter)
- **p** Wetted Perimeter of Channel (Meter)
- **$R_{h(cir)}$** Hydraulic Radius of Circular Channel (Meter)
- **T_{cir}** Top Width of Circular Channel (Meter)
- **Z_{cir}** Section Factor of Circular Channel (Meter^{2.5})
- **θ_{Angle}** Subtended Angle in Radians (Degree)

Constants, Functions, Measurements used in list of Geometrical Properties of Circular Channel Section Formulas above

- **constant(s):** π , 3.14159265358979323846264338327950288
Archimedes' constant
- **Functions: asin**, asin(Number)
The inverse sine function, is a trigonometric function that takes a ratio of two sides of a right triangle and outputs the angle opposite the side with the given ratio.
- **Functions: sin**, sin(Angle)
Sine is a trigonometric function that describes the ratio of the length of the opposite side of a right triangle to the length of the hypotenuse.
- **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: Angle** in Degree (°)
Angle Unit Conversion 
- **Measurement: Section Factor** in Meter^{2.5} (m^{2.5})
Section Factor Unit Conversion 



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