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Geometrical Properties of Circular Channel Section Formulas

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List of 14 Geometrical Properties of Circular Channel Section Formulas

Geometrical Properties of Circular Channel Section

1) Angle of Sector given Top Width

Open Calculator

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

ex $$3.140202^\circ = 2 \cdot a\sin\left(\left(\frac{0.137\text{m}}{5\text{m}}\right)\right)$$

2) Angle of Sector given Wetted Perimeter

Open Calculator

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

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

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3) Diameter of Section given Hydraulic Depth

Open Calculator

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

ex $$5.000216\text{m} = \frac{0.713\text{m}}{0.125 \cdot \left(\left(3.14^\circ \cdot \left(\frac{180}{\pi} \right) \right) - \frac{\sin(3.14^\circ)}{\sin\left(\frac{3.14^\circ}{2}\right)} \right)}$$

4) Diameter of Section given Hydraulic Radius for Channel

Open Calculator

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

ex $$5.088771\text{m} = \frac{1.25\text{m}}{0.25 \cdot \left(1 - \left(\frac{\sin(3.14^\circ)}{\left(\frac{180}{\pi}\right) \cdot 3.14^\circ} \right) \right)}$$

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5) Diameter of Section given Section Factor

Open Calculator

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

$$4.999919\text{m} = \left(\frac{80.88\text{m}\hat{}2.5}{\left(\frac{\sqrt{2}}{32}\right) \cdot \frac{\left(\left(\frac{180}{\pi}\right)\cdot 3.14^\circ - \sin(3.14^\circ)\right)^{1.5}}{\left(\sin\left(\frac{3.14^\circ}{2}\right)\right)^{0.5}}} \right)^{\frac{2}{5}}$$

6) Diameter of Section given Top Width

Open Calculator

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

$$5.000321\text{m} = \frac{0.137\text{m}}{\sin\left(\frac{3.14^\circ}{2}\right)}$$

7) Diameter of Section given Wetted Area

Open Calculator

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

$$5.004748\text{m} = \sqrt{\frac{\left(\frac{180}{\pi}\right) \cdot \left(3.14^\circ\right) - \left(8 \cdot 0.221\text{m}^2\right)}{\sin\left(3.14^\circ\right)}}$$

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8) Diameter of Section given Wetted Perimeter

Open Calculator

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

$$10.19108\text{m} = \frac{16\text{m}}{0.5 \cdot 3.14^\circ \cdot \left(\frac{180}{\pi}\right)}$$

9) Hydraulic Depth of Circle

Open Calculator

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

$$0.712969\text{m} = (5\text{m} \cdot 0.125) \cdot \left(\left(\frac{180}{\pi}\right) \cdot 3.14^\circ - \frac{\sin(3.14^\circ)}{\sin\left(\frac{3.14^\circ}{2}\right)}\right)$$

10) Hydraulic Radius given Angle

Open Calculator

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

$$1.249935\text{m} = 0.25 \cdot 5\text{m} \cdot \left(1 - \frac{\sin(3.14^\circ)}{\frac{180}{\pi}} \cdot 3.14^\circ\right)$$

11) Section Factor for Circle

Open Calculator

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

ex

$$80.88328\text{m}\hat{}2.5 = \left(\left(\frac{\sqrt{2}}{32} \right) \cdot \left((5\text{m})^{2.5} \right) \cdot \frac{\left(\left(\frac{180}{\pi} \right) \cdot 3.14^\circ - \sin(3.14^\circ) \right)^{1.5}}{\left(\sin\left(\frac{3.14^\circ}{2} \right) \right)^{0.5}} \right)$$

12) Top Width for Circle

Open Calculator

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

ex

$$0.136991\text{m} = 5\text{m} \cdot \sin\left(\frac{3.14^\circ}{2} \right)$$

13) Wetted Area for Circle

Open Calculator

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

ex

$$0.221325\text{m}^2 = \left(\frac{1}{8} \right) \cdot \left(\left(\frac{180}{\pi} \right) \cdot 3.14^\circ - \sin(3.14^\circ) \cdot \left((5\text{m})^2 \right) \right)$$

14) Wetted Perimeter for circle

Open Calculator

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

ex $$7.85\text{m} = 0.5 \cdot 3.14^\circ \cdot 5\text{m} \cdot \frac{180}{\pi}$$

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Variables Used

- $A_{w(cir)}$ 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)*

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Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Function: **asin**, asin(Number)
  Inverse trigonometric sine function
- Function: **sin**, sin(Angle)
  Trigonometric sine function
- Function: **sqrt**, sqrt(Number)
  Square root function
- 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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- Geometrical Properties of Circular Channel Section Formulas
- Geometrical Properties of Parabolic Channel Section Formulas
- Geometrical Properties of Rectangular Channel Section Formulas
- Geometrical Properties of Trapezoidal Channel Section Formulas
- Geometrical Properties of Triangular Channel Section Formulas

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