Important Section modulus, Hydraulic Depth and Practical Channel Sections Formulas PDF

Formulas
Examples
with Units

List of 19
Important Section modulus, Hydraulic Depth and Practical Channel Sections Formulas

1) Hydraulic Depth Formulas

1.1) Hydraulic Depth Formula

Evaluate Formula

Formula

$$D_{Hydraulic} = \frac{A}{T}$$

Example with Units

$$11.9048\,\text{m} = \frac{25\,\text{m}^2}{2.1\,\text{m}}$$

1.2) Hydraulic Radius or Hydraulic Mean Depth Formula

Evaluate Formula

Formula

$$R_H = \frac{A}{p}$$

Example with Units

$$1.5625\,\text{m} = \frac{25\,\text{m}^2}{16\,\text{m}}$$

1.3) Top Width given Hydraulic Depth Formula

Evaluate Formula

Formula

$$T = \frac{A}{D_{Hydraulic}}$$

Example with Units

$$8.3333\,\text{m} = \frac{25\,\text{m}^2}{3\,\text{m}}$$

1.4) Wetted Area given Hydraulic Depth Formula

Evaluate Formula

Formula

$$A = D_{Hydraulic} \cdot T$$

Example with Units

$$6.3\,\text{m}^2 = 3\,\text{m} \cdot 2.1\,\text{m}$$

1.5) Wetted Area given Hydraulic Mean Depth Formula

Evaluate Formula

Formula

$$A = R_H \cdot p$$

Example with Units

$$25.6\,\text{m}^2 = 1.6\,\text{m} \cdot 16\,\text{m}$$

1.6) Wetted Perimeter given Hydraulic Mean Depth Formula

Evaluate Formula

Formula

$$p = \frac{A}{R_H}$$

Example with Units

$$15.625\,\text{m} = \frac{25\,\text{m}^2}{1.6\,\text{m}}$$

2) Practical Channel Sections Formulas

2.1) Depth of Flow given Wetted Area of Triangular Channel Section Formula

Evaluate Formula

Formula

$$d_f = \sqrt{\frac{A}{\theta + \cot(\theta)}}$$

Example with Units

$$3.3292\,\text{m} = \sqrt{\frac{25\,\text{m}^2}{30° + \cot(30°)}}$$

2.2) Depth of Flow given Wetted Perimeter of Triangular Channel Section Formula

Evaluate Formula

Formula

$$d_f = \frac{p}{2 \cdot (\theta + \cot(\theta))}$$

Example with Units

$$3.5467\,\text{m} = \frac{16\,\text{m}}{2 \cdot (30° + \cot(30°))}$$

2.3) Hydraulic Radius of Trapezoidal Channel Section Formula

Evaluate Formula

Formula

$$R_H = \frac{d_f \cdot (B + d_f \cdot (\theta + \cot(\theta)))}{B + 2 \cdot d_f \cdot (\theta + \cot(\theta))}$$

Example with Units

$$1.661\,\text{m} = \frac{3.3\,\text{m} \cdot (100\,\text{mm} + 3.3\,\text{m} \cdot (30° + \cot(30°)))}{100\,\text{mm} + 2 \cdot 3.3\,\text{m} \cdot (30° + \cot(30°))}$$

2.4) Hydraulic Radius of Triangular Channel Section Formula

Evaluate Formula

Formula

$$R_H = \frac{d_f}{2}$$

Example with Units

$$1.65\,\text{m} = \frac{3.3\,\text{m}}{2}$$

2.5) Wetted Area of Trapezoidal Channel Section Formula

Evaluate Formula

Formula

$$A = d_f \cdot (B + d_f \cdot (\theta + \cot(\theta)))$$

Example with Units

$$24.894\,\text{m}^2 = 3.3\,\text{m} \cdot (100\,\text{mm} + 3.3\,\text{m} \cdot (30° + \cot(30°)))$$

2.6) Wetted Area of Triangular Channel Section Formula

Evaluate Formula

Formula

$$A = \left(d_f^{\,2}\right) \cdot (\theta + \cot(\theta))$$

Example with Units

$$24.564\,\text{m}^2 = \left(3.3\,\text{m}^{\,2}\right) \cdot (30° + \cot(30°))$$

2.7) Wetted Perimeter of Trapezoidal Channel Section Formula

Evaluate Formula

Formula

$$p = \left(B + 2 \cdot d_f \cdot \left(\theta + \cot\left(\theta \right) \right) \right)$$

Example with Units

$$14.9873\,\text{m} = \left(100\,\text{mm} + 2 \cdot 3.3\,\text{m} \cdot \left(30° + \cot\left(30° \right) \right) \right)$$

2.8) Wetted Perimeter of Triangular Channel Section Formula

Evaluate Formula

Formula

$$p = 2 \cdot d_f \cdot \left(\theta + \cot\left(\theta \right) \right)$$

Example with Units

$$14.8873\,\text{m} = 2 \cdot 3.3\,\text{m} \cdot \left(30° + \cot\left(30° \right) \right)$$

3) Section modulus Formulas

3.1) Section Modulus of Circular Section Formula

Evaluate Formula

Formula

$$z = \frac{\pi \cdot \left(d_{section}^{3} \right)}{32}$$

Example with Units

$$12.2718\,\text{mm}^3 = \frac{3.1416 \cdot \left(5\,\text{m}^{3} \right)}{32}$$

3.2) Section Modulus of Hollow circular tube of uniform section Formula

Evaluate Formula

Formula

$$z = \frac{\pi \cdot \left(\left(d_{section}^{4} \right) - \left(d_i^{4} \right) \right)}{32 \cdot d_{section}}$$

Example with Units

$$12.2718\,\text{mm}^3 = \frac{3.1416 \cdot \left(\left(5\,\text{m}^{4} \right) - \left(2\,\text{mm}^{4} \right) \right)}{32 \cdot 5\,\text{m}}$$

3.3) Section Modulus of Hollow Rectangular Section Formula

Evaluate Formula

Formula

$$z = \frac{B_H \cdot \left(D^3 \right) - b \cdot \left(d^3 \right)}{6 \cdot D}$$

Example with Units

$$3.3\text{E-}5\,\text{mm}^3 = \frac{20\,\text{mm} \cdot \left(100.1\,\text{mm}^{3} \right) - 10.2\,\text{mm} \cdot \left(10\,\text{mm}^{3} \right)}{6 \cdot 100.1\,\text{mm}}$$

3.4) Section Modulus of Rectangular Section Formula

Evaluate Formula

Formula

$$z = \frac{B_H \cdot \left(D^2 \right)}{6}$$

Example with Units

$$3.3\text{E-}5\,\text{mm}^3 = \frac{20\,\text{mm} \cdot \left(100.1\,\text{mm}^{2} \right)}{6}$$

3.5) Section Modulus of Triangular Section Formula

Evaluate Formula

Formula

$$z = \frac{B_H \cdot \left(H_s^{\,2} \right)}{24}$$

Example with Units

$$85.0083\,\text{mm}^3 = \frac{20\,\text{mm} \cdot \left(10.1\,\text{mm}^{\,2} \right)}{24}$$

Variables used in list of Section modulus, Hydraulic Depth and Practical Channel Sections Formulas above

- **A** Wetted Surface Area of Channel *(Square Meter)*
- **b** Interior Width of Section *(Millimeter)*
- **B** Width of Trapezoidal Channel Section *(Millimeter)*
- B_H Width of a Section Channel *(Millimeter)*
- **d** Interior Depth of Section *(Millimeter)*
- **D** Depth of Section *(Millimeter)*
- d_f Depth of Flow *(Meter)*
- $D_{Hydraulic}$ Hydraulic Depth *(Meter)*
- d_i Interior Diameter of Circular Section *(Millimeter)*
- $d_{section}$ Diameter of Section *(Meter)*
- H_s Height of Section *(Millimeter)*
- **p** Wetted Perimeter of Channel *(Meter)*
- R_H Hydraulic Radius of Channel *(Meter)*
- **T** Top Width *(Meter)*
- **z** Section Modulus *(Cubic Millimeter)*
- **θ** Theta *(Degree)*

Constants, Functions, Measurements used in list of Section modulus, Hydraulic Depth and Practical Channel Sections Formulas above

- constant(s): **pi**, 3.14159265358979323846264338327950288 *Archimedes' constant*
- Functions: **cot**, cot(Angle) *Cotangent is a trigonometric function that is defined as the ratio of the adjacent side to the opposite side in a right triangle.*
- 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), Millimeter (mm) *Length Unit Conversion*
- Measurement: **Volume** in Cubic Millimeter (mm^3) *Volume Unit Conversion*
- Measurement: **Area** in Square Meter (m^2) *Area Unit Conversion*
- Measurement: **Angle** in Degree (°) *Angle Unit Conversion*

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