Important Wave Celerity Formulas PDF

Formulas
Examples
with Units

List of 12
Important Wave Celerity Formulas

1) Celerity of Deepwater Wave Formula

Evaluate Formula

Formula

$$C_o = \sqrt{\frac{[g] \cdot \lambda_o}{2 \cdot \pi}}$$

Example with Units

$$4.5045\,\text{m/s} = \sqrt{\frac{9.8066\,\text{m/s}^2 \cdot 13\,\text{m}}{2 \cdot 3.1416}}$$

2) Celerity of Wave given Deepwater Celerity and Wavelength Formula

Evaluate Formula

Formula

$$C_s = \frac{C_o \cdot \lambda_s}{\lambda_o}$$

Example with Units

$$2.7692\,\text{m/s} = \frac{4.5\,\text{m/s} \cdot 8\,\text{m}}{13\,\text{m}}$$

3) Deepwater Celerity for Deepwater wavelength Formula

Evaluate Formula

Formula

$$C_o = \frac{C_s \cdot \lambda_o}{\lambda_s}$$

Example with Units

$$4.55\,\text{m/s} = \frac{2.8\,\text{m/s} \cdot 13\,\text{m}}{8\,\text{m}}$$

4) Deepwater Celerity given Units of Feet and Seconds Formula

Evaluate Formula

Formula

$$C_f = 5.12 \cdot T$$

Example with Units

$$50.3937\,\text{ft/s} = 5.12 \cdot 3\,\text{s}$$

5) Deepwater Celerity given Wave Period Formula

Evaluate Formula

Formula

$$C_o = \frac{[g] \cdot T}{2 \cdot \pi}$$

Example with Units

$$4.6823\,\text{m/s} = \frac{9.8066\,\text{m/s}^2 \cdot 3\,\text{s}}{2 \cdot 3.1416}$$

6) Deepwater Celerity when SI systems Units of Meters and Seconds is considered Formula

Evaluate Formula

Formula

$$C_o = 1.56 \cdot T$$

Example with Units

$$4.68\,\text{m/s} = 1.56 \cdot 3\,\text{s}$$

7) Deepwater Wave Celerity Formula

Evaluate Formula

Formula

$$C_o = \frac{\lambda_o}{T}$$

Example with Units

$$4.3333\,\text{m/s} = \frac{13\,\text{m}}{3\,\text{s}}$$

8) Wave Celerity given Wave Period and Wavelength Formula

Evaluate Formula

Formula

$$C_o = \left(\frac{[g] \cdot T}{2 \cdot \pi}\right) \cdot \tanh\left(\frac{2 \cdot \pi \cdot d}{\lambda_o}\right)$$

Example with Units

$$4.5927\,\text{m/s} = \left(\frac{9.8066\,\text{m/s}^2 \cdot 3\,\text{s}}{2 \cdot 3.1416}\right) \cdot \tanh\left(\frac{2 \cdot 3.1416 \cdot 4.8\,\text{m}}{13\,\text{m}}\right)$$

9) Wave Celerity given Wavelength and Water Depth Formula

Evaluate Formula

Formula

$$C_o = \sqrt{\left(\frac{\lambda_o \cdot [g]}{2 \cdot \pi}\right) \cdot \tanh\left(\frac{2 \cdot \pi \cdot d}{\lambda_o}\right)}$$

Example with Units

$$4.4612\,\text{m/s} = \sqrt{\left(\frac{13\,\text{m} \cdot 9.8066\,\text{m/s}^2}{2 \cdot 3.1416}\right) \cdot \tanh\left(\frac{2 \cdot 3.1416 \cdot 4.8\,\text{m}}{13\,\text{m}}\right)}$$

10) Wave Celerity given Wavelength and Wave Period Formula

Evaluate Formula

Formula

$$C_o = \frac{\lambda_o}{T}$$

Example with Units

$$4.3333\,\text{m/s} = \frac{13\,\text{m}}{3\,\text{s}}$$

11) Wave Celerity when Relative Water Depth becomes Shallow Formula

Evaluate Formula

Formula

$$C_s = \sqrt{[g] \cdot d_s}$$

Example with Units

$$2.8009\,\text{m/s} = \sqrt{9.8066\,\text{m/s}^2 \cdot 0.8\,\text{m}}$$

12) Wave Period given Deepwater Celerity Formula

Evaluate Formula

Formula

$$T = \frac{\lambda_o}{C_o}$$

Example with Units

$$2.8889\,\text{s} = \frac{13\,\text{m}}{4.5\,\text{m/s}}$$

Variables used in list of Wave Celerity Formulas above

- C_f Celerity in FPS Unit *(Foot per Second)*
- C_o Deepwater Wave Celerity *(Meter per Second)*
- C_s Celerity for Shallow Depth *(Meter per Second)*
- **d** Water Depth *(Meter)*
- d_s Shallow Depth *(Meter)*
- **T** Wave Period *(Second)*
- λ_o DeepWater Wavelength *(Meter)*
- λ_s Wavelength for Shallow Depth *(Meter)*

Constants, Functions, Measurements used in list of Wave Celerity Formulas above

- constant(s): **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- constant(s): **[g]**, 9.80665
  Gravitational acceleration on Earth
- 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.
- Functions: **tanh**, tanh(Number)
  The hyperbolic tangent function (tanh) is a function that is defined as the ratio of the hyperbolic sine function (sinh) to the hyperbolic cosine function (cosh).
- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Time** in Second (s)
  Time Unit Conversion
- Measurement: **Speed** in Meter per Second (m/s), Foot per Second (ft/s)
  Speed Unit Conversion

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