calculatoratoz.com

unitsconverters.com

Wave Prediction Formulas

Calculators! Examples! Conversions!

Bookmark **calculatoratoz.com**, **unitsconverters.com**

Widest Coverage of Calculators and Growing - **30,000+ Calculators!**
Calculate With a Different Unit for Each Variable - **In built Unit Conversion!**
Widest Collection of Measurements and Units - **250+ Measurements!**

Feel free to SHARE this document with your friends!

Please leave your feedback here...

List of 15 Wave Prediction Formulas

Wave Prediction

Predicting Waves in Deep Water

1) Significant Wave Height from Bretschneider Empirical Relationships

fx Open Calculator

$$H_{dw} = \frac{U^2 \cdot 0.283 \cdot \tanh\left(0.0125 \cdot \left(\frac{[g] \cdot F_l}{U^2}\right)^{0.42}\right)}{[g]}$$

ex $$0.052681\text{m} = \frac{(25\text{m/s})^2 \cdot 0.283 \cdot \tanh\left(0.0125 \cdot \left(\frac{[g] \cdot 2\text{m}}{(25\text{m/s})^2}\right)^{0.42}\right)}{[g]}$$

2) Significant Wave Period from Bretschneider Empirical Relationships

Open Calculator

fx $$T = \frac{U \cdot 7.54 \cdot \tanh\left(0.077 \cdot \left(\frac{[g] \cdot F_l}{U^2}\right)^{0.25}\right)}{[g]}$$

ex $$0.622726\text{s} = \frac{25\text{m/s} \cdot 7.54 \cdot \tanh\left(0.077 \cdot \left(\frac{[g] \cdot 2\text{m}}{(25\text{m/s})^2}\right)^{0.25}\right)}{[g]}$$

3) Water Depth given Wavelength, Wave Period and Wave Number

Open Calculator

fx $$d = \frac{a\tanh\left(\frac{L\cdot\omega}{[g]\cdot T}\right)}{k}$$

ex $$2.157505\text{m} = \frac{a\tanh\left(\frac{0.4\text{m}\cdot 6.2\text{rad/s}}{[g]\cdot 0.622\text{s}}\right)}{0.2}$$

4) Wave Number given Wavelength, Wave Period and Water Depth

Open Calculator

fx $$k = \frac{a\tanh\left(\frac{L\cdot\omega}{[g]\cdot T}\right)}{d}$$

ex $$0.200698 = \frac{a\tanh\left(\frac{0.4\text{m}\cdot 6.2\text{rad/s}}{[g]\cdot 0.622\text{s}}\right)}{2.15\text{m}}$$

Wave Statistics Relationships

5) Average of Waves based upon Rayleigh Distribution

Open Calculator

fx $$H' = 0.886 \cdot H_{rms}$$

ex $$39.87 = 0.886 \cdot 45\text{m}$$

6) Average of Waves given Significant Wave Height

Open Calculator

fx $$H' = \frac{H_s}{1.596}$$

ex $$40.72682 = \frac{65\text{m}}{1.596}$$

7) Probability of Exceedance of Wave Height

Open Calculator

fx $$P_H = \left(e^{-2}\right) \cdot \left(\frac{H}{H_s}\right)^2$$

ex $$0.205005 = \left(e^{-2}\right) \cdot \left(\frac{80\text{m}}{65\text{m}}\right)^2$$

8) Root Mean Square Wave Height

Open Calculator

fx $$H_{rms} = \frac{\sigma_H}{0.463}$$

ex $$49.67603\text{m} = \frac{23}{0.463}$$

9) Root Mean Square Wave Height given Average of Waves based upon Rayleigh Distribution

Open Calculator

fx $$H_{rms} = \frac{H'}{0.886}$$

ex $$45.14673\text{m} = \frac{40}{0.886}$$

10) Root Mean Square Wave Height given Significant Wave Height based on Rayleigh Distribution

Open Calculator

fx $$H_{rms} = \frac{H_s}{1.414}$$

ex $$45.96888\text{m} = \frac{65\text{m}}{1.414}$$

11) Significant Wave Height given Average of Waves

Open Calculator

fx $$H_s = 1.596 \cdot H'$$

ex $$63.84\text{m} = 1.596 \cdot 40$$

12) Significant Wave Height of Record based upon Rayleigh Distribution

Open Calculator

fx $$H_s = 1.414 \cdot H_{rms}$$

ex $$63.63\text{m} = 1.414 \cdot 45\text{m}$$

13) Significant Wave Height of Record for Probability of Exceedance

Open Calculator

fx $$H_s = \frac{H}{\left(\frac{P_H}{e^{-2}}\right)^{0.5}}$$

ex $$65.00078\text{m} = \frac{80\text{m}}{\left(\frac{0.205}{e^{-2}}\right)^{0.5}}$$

14) Standard Deviation of Wave Height

Open Calculator

fx $\sigma_H = 0.463 \cdot H_{rms}$

ex $20.835 = 0.463 \cdot 45\text{m}$

15) Wave Height of Record for Probability of Exceedance

Open Calculator

fx $H = H_s \cdot \left(\frac{P_H}{e^{-2}} \right)^{0.5}$

ex $79.99904\text{m} = 65\text{m} \cdot \left(\frac{0.205}{e^{-2}} \right)^{0.5}$

Variables Used

- **d** Water Depth *(Meter)*
- **F_l** Fetch Length *(Meter)*
- **H** Wave Height *(Meter)*
- **H'** Average of All Waves
- **H_{dw}** Wave Height for Deep Water *(Meter)*
- **H_{rms}** Root Mean Square Wave Height *(Meter)*
- **H_s** Significant Wave Height *(Meter)*
- **k** Wave Number for Water Wave
- **L** Wavelength *(Meter)*
- **P_H** Probability of Exceedance of Wave Height
- **T** Wave Period *(Second)*
- **U** Wind Speed *(Meter per Second)*
- **σ_H** Standard Deviation of Wave Height
- **ω** Wave Angular Frequency *(Radian per Second)*

Constants, Functions, Measurements used

- Constant: **[g]**, 9.80665
  Gravitational acceleration on Earth
- Constant: **e**, 2.71828182845904523536028747135266249
  Napier's constant
- Function: **atanh**, atanh(Number)
  The inverse hyperbolic tangent function returns the value whose hyperbolic tangent is a number.
- Function: **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)
  Speed Unit Conversion
- Measurement: **Angular Frequency** in Radian per Second (rad/s)
  Angular Frequency Unit Conversion

Check other formula lists

- Calculation of Forces on Ocean Structures Formulas
- Density Currents in Harbors Formulas
- Density Currents in Rivers Formulas
- Dredging Equipment Formulas
- Estimating Marine and Coastal Winds Formulas
- Hydrodynamic Analysis and Design Conditions Formulas
- Hydrodynamics of Tidal Inlets-2 Formulas
- Meteorology and Wave Climate Formulas
- Oceanography Formulas
- Shore Protection Formulas
- Wave Prediction Formulas

Feel free to SHARE this document with your friends!

PDF Available in

English Spanish French German Russian Italian Portuguese Polish Dutch

5/21/2024 | 6:47:27 AM UTC

Please leave your feedback here...