Important Return Period and Encounter Probability **Formulas PDF**



Formulas Examples with Units

List of 9 Important Return Period and Encounter **Probability Formulas**

3.1

1) Cumulative Probability of Design Significant Wave Height given Return Period Formula 🕝

FormulaExample
$$PH_s = -\left(\left(\frac{t}{T_r}\right) - 1\right)$$
 $0.4 = -\left(\left(\frac{30}{50}\right) - 1\right)$

2) Encounter Probability Formula 🕝

Evaluate Formula

Evaluate Formula 🦳

Evaluate Formula 🦳

FormulaExample
$$P_e = 1 - \left(1 - \left(\frac{t}{T_r}\right)\right)^L$$
 $0.9416 = 1 - \left(1 - \left(\frac{30}{50}\right)\right)^L$

3) Mean Value of Maximum Monthly Wind Speeds for Wind Speed with r-year Return Period Formula 🗖

Formula

$$\mathbf{U}_{\mathrm{m}} = \mathbf{U}_{\mathrm{r}} \cdot \left(0.78 \cdot \boldsymbol{\sigma}_{\mathrm{m}} \cdot \left(\ln \left(12 \cdot \mathbf{T}_{\mathrm{r}} \right) \cdot 0.577 \right) \right)$$

Example with Units

 $17.5287 \text{ m/s} = 32.6 \text{ m/s} - (0.78 \cdot 3.32 \cdot (\ln(12 \cdot 50) - 0.577))$

4) Return Period given Cumulative Probability Formula

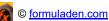
Evaluate Formula

Example Formula

$$T_r = \frac{t}{1 - PH_s}$$
 $50 = \frac{30}{1 - 0.4}$

5) Significant Wave Height for Free Long Waves Formula 🕝 Evaluate Formula

$$H_{sf} = \frac{K \cdot H_s^{1.11} \cdot T_p^{1.25}}{D^{0.25}} \qquad 16.5777_m = \frac{0.0041 \cdot 65_m^{1.11} \cdot 31_s^{1.25}}{12_m^{0.25}}$$



6) Standard Deviation of Maximum Monthly Wind Speeds given Wind Speed with r-year Return Period Formula

	Formula
σ _m =	U _r - U _m
	$0.78 \cdot \left(\ln \left(12 \cdot \mathbf{T}_{r} \right) - 0.577 \right)$

Example with Units 32.6 m/s - 17.50 m/s 3.3263 = $0.78 \cdot (\ln(12 \cdot 50) - 0.577)$

7) Time Interval Associated with Each Data Point given Return Period Formula 🕝 Evaluate Formula

Evaluate Formula

Evaluate Formula

Evaluate Formula

Formula	Example
$\mathbf{t} = \mathbf{T}_{\mathbf{r}} \cdot \left(1 - \mathbf{P} \mathbf{H}_{\mathbf{s}} \right)$	$30 = 50 \cdot (1 - 0.4)$

8) Velocity at Surface given Volume Flow Rate Per Unit of Ocean Width Formula 🕝

Formula	Example with Units
$V_{\rm s} = \frac{q_{\rm x} \cdot \pi \cdot \sqrt{2}}{D}$	$0.4998 \mathrm{m/s} = \frac{13.5 \mathrm{m^3/s} \cdot 3.1416 \cdot \sqrt{2}}{120 \mathrm{m}}$
DF	

9) Wind Speed with r-year Return Period Formula 🕝

$$\mathbf{U}_{r} = \mathbf{U}_{m} + 0.78 \cdot \boldsymbol{\sigma}_{m} \cdot \left(\ln \left(12 \cdot \mathbf{T}_{r} \right) - 0.577 \right)$$

 $32.5713 \text{ m/s} = 17.50 \text{ m/s} + 0.78 \cdot 3.32 \cdot (\ln(12 \cdot 50) - 0.577)$



Variables used in list of Return Period and Encounter Probability Formulas above

- D Water Depth (Meter)
- **D**_F Depth of Frictional Influence (Meter)
- H_s Significant Wave Height (Meter)
- H_{sf} Significant Wave Height for Free Waves (Meter)
- K Constant for Free Long Waves
- L Desired Time Period
- Pe Encounter Probability
- PH_s Cumulative Probability
- q_X Volume Flow Rates per unit of Ocean Width (Cubic Meter per Second)
- t Time Interval associated with each Data Point
- T_p Design Wave Period (Second)
- T_r Return Period of Wind
- **U**_m Mean Value of Maximum Monthly Wind Speeds (*Meter per Second*)
- U_r Wind Speed with r Year Return Period (Meter per Second)
- V_s Velocity at the Surface (Meter per Second)
- σ_m Standard Deviation of Maximum Monthly Wind Speeds

Constants, Functions, Measurements used in list of Return Period and Encounter Probability Formulas above

- constant(s): pi,
 3.14159265358979323846264338327950288
 Archimedes' constant
- Functions: In, In(Number) The natural logarithm, also known as the logarithm to the base e, is the inverse function of the natural exponential function.
- 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: Time in Second (s) Time Unit Conversion
- Measurement: Speed in Meter per Second (m/s) Speed Unit Conversion
- Measurement: Volumetric Flow Rate in Cubic Meter per Second (m³/s) Volumetric Flow Rate Unit Conversion

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 Important Return Period and Encounter Probability Formulas (

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