



Wave Setup 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 20 Wave Setup Formulas

Wave Setup

1) Beach Slope given Nonbreaking Upper Limit of Runup 🗗



 $eta = rac{\pi}{2} \cdot \left(rac{\mathrm{R}}{\mathrm{H}_{\mathrm{o}}} \cdot (2 \cdot \pi)^{0.5}
ight)^4$

 $0.765587 = \frac{\pi}{2} \cdot \left(\frac{20 \text{m}}{60 \text{m}} \cdot (2 \cdot \pi)^{0.5}\right)^4$

Open Calculator

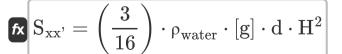
2) Breaker Depth Index given Set-down at Breaker Point at Still-Water Shoreline 🔽

 $\left| \gamma_{b} = \sqrt{rac{8}{3} \cdot \left(\left(rac{d_{b}}{n_{-} - n_{1}}
ight) - 1
ight)}
ight|$

Open Calculator

 $0.335694 = \sqrt{rac{8}{3} \cdot \left(\left(rac{55 ext{m}}{53.0 ext{m} - 0.23 ext{m}}
ight) - 1
ight)}$

3) Cross-Shore Component of Cross-Shore directed Radiation Stress



Open Calculator

 $17376.16 = \left(\frac{3}{16}\right) \cdot 1000 \text{kg/m}^3 \cdot [\text{g}] \cdot 1.05 \text{m} \cdot (3\text{m})^2$





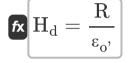


4) Deepwater Wave Height given Nonbreaking Upper Limit of Runup on Uniform Slope

fx $H_{
m d}=rac{
m R}{\left(2\cdot\pi
ight)^{0.5}\cdot\left(rac{\pi}{2}\cdoteta
ight)^{rac{1}{4}}}$

Open Calculator

5) Deepwater Wave Height given Wave Runup above Mean Water Level



Open Calculator

 $= \frac{6.024096 \text{m}}{3.32}$

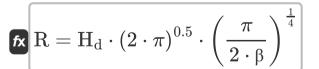
6) Mean Water Surface Elevation given Total Water Depth

fx $\eta' = \mathrm{H_c} - \mathrm{h}$

Open Calculator 🚰

29m = 49m - 20.0m

7) Nonbreaking Upper Limit of Runup on Uniform Slope



Open Calculator 🚰

ex $18.03299 \mathrm{m} = 6.0 \mathrm{m} \cdot (2 \cdot \pi)^{0.5} \cdot \left(\frac{\pi}{2 \cdot 0.76}\right)^{\frac{1}{4}}$





8) Set down for Regular Waves

$$\text{fx} \boxed{ \eta'_{o} = \left(-\frac{1}{8} \right) \cdot \left(\frac{H^2 \cdot \left(2 \cdot \frac{\pi}{\lambda} \right)}{\sinh \left(4 \cdot \pi \cdot \frac{d}{\lambda} \right)} \right) }$$

Open Calculator

$$-0.514668 \mathrm{m} = \left(-\frac{1}{8}\right) \cdot \left(\frac{\left(3 \mathrm{m}\right)^2 \cdot \left(2 \cdot \frac{\pi}{26.8 \mathrm{m}}\right)}{\sinh \left(4 \cdot \pi \cdot \frac{1.05 \mathrm{m}}{26.8 \mathrm{m}}\right)}\right)$$

9) Setdown at Breaker Point at Still-Water Shoreline

$$\eta_{
m b} = \eta_{
m s} - \left(rac{1}{1+\left(rac{8}{3\cdot \Upsilon_{
m s}^2}
ight)}
ight)\cdot {
m d}_{
m b}$$

Open Calculator 🖸

ex
$$0.24829 \mathrm{m} = 53.0 \mathrm{m} - \left(\frac{1}{1 + \left(\frac{8}{3 \cdot (7.91)^2} \right)} \right) \cdot 55 \mathrm{m}$$

10) Setup at Mean Shoreline

fx
$$\left[\eta'_{
m max} = \eta_{
m s} + ({
m d}\eta' {
m d}{
m x} \cdot \Delta_{
m x})
ight]$$

Open Calculator

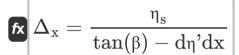


11) Setup at Still-Water Shoreline

$$ag{fx} egin{aligned} \eta_{
m s} = \eta_{
m b} + \left(rac{1}{1 + \left(rac{8}{3 \cdot \Upsilon_{
m s}^2}
ight)}
ight) \cdot d_{
m b} \end{aligned}$$

Open Calculator 2

12) Shoreward Displacement of Shoreline



Open Calculator

13) Still Water Depth given Total Water Depth

fx
$$h=H_c-\eta$$
 ,

Open Calculator 2

20m = 49m - 29m



14) Surf Similarity Parameter given Wave Runup above Mean Water Level

fx $arepsilon_{o'} = rac{R}{H_d}$

Open Calculator 🚰

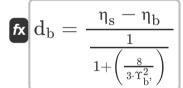
15) Total Water Depth

fx $H_c = h + \eta$ '

Open Calculator

49 m = 20.0 m + 29 m

16) Water Depth at Breaking given Setdown at Breaker Point at Still-Water Shoreline



Open Calculator

$$ext{ex} 55.01907 ext{m} = rac{53.0 ext{m} - 0.23 ext{m}}{rac{1}{1 + \left(rac{8}{3 \cdot (7.91)^2}
ight)}}$$



17) Water Depth given Cross Shore Component

fx $d = rac{\mathrm{S_{xx}}}{\left(rac{3}{16}
ight)\cdot
ho_{\mathrm{water}}\cdot [\mathrm{g}]\cdot \mathrm{H}^2}$

Open Calculator

ex $1.04999 \mathrm{m} = rac{17376}{\left(rac{3}{16}
ight) \cdot 1000 \mathrm{kg/m^3 \cdot [g] \cdot (3m)^2}}$

18) Wave Height given Cross-Shore Component

 $ext{fx} egin{aligned} \mathbb{H} = \sqrt{rac{16 \cdot \mathrm{S_{xx'}}}{3 \cdot
ho_{\mathrm{water}} \cdot [\mathrm{g}] \cdot \mathrm{d}}} \end{aligned}$

Open Calculator

ex $2.999986 \mathrm{m} = \sqrt{\frac{16 \cdot 17376}{3 \cdot 1000 \mathrm{kg/m^3 \cdot [g] \cdot 1.05 \mathrm{m}}}}$

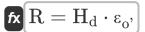
19) Wave Height given Mean Water Surface Elevation Set down for Regular Waves

 $extbf{H} = \sqrt{\eta'_{
m o} \cdot 8 \cdot rac{\sinh\left(4 \cdot \pi \cdot rac{
m d}{\lambda}
ight)}{2 \cdot rac{\pi}{\lambda}}}$

Open Calculator



20) Wave Runup above Mean Water Level



Open Calculator

 $= 19.92 \mathrm{m} = 6.0 \mathrm{m} \cdot 3.32$



Variables Used

- d Water Depth (Meter)
- **d**_b Water Depth at Breaking (Meter)
- dn'dx Cross-Shore Balance Momentum
- **h** Still-Water Depth (Meter)
- **H** Wave Height (Meter)
- **H**_c Coastal Water Depth (*Meter*)
- H_d Deepwater Wave Height (Meter)
- Ho Deepwater Wave Height of Ocean (Meter)
- **R** Wave Runup (Meter)
- Sxx¹ Coastal Cross-Shore Component
- β Beach Slope
- γ_b Breaker Depth Index
- Δ_x Shoreward Displacement of the Shoreline
- ε₀ Deepwater Surf Similarity Parameter
- η' Mean Water Surface Elevation (Meter)
- η_b Set Down at the Breaker Point (Meter)
- η'_{max} Setup at the Mean Shoreline
- η'_o Mean Water Surface Elevation of Coast (Meter)
- η_s Setup at the Still-Water Shore Line (Meter)
- λ Wavelength of Coast (Meter)
- Pwater Water Density (Kilogram per Cubic Meter)
- Y_b Coastal Breaker Depth Index



Constants, Functions, Measurements used

- Constant: pi, 3.14159265358979323846264338327950288
 Archimedes' constant
- Constant: [g], 9.80665

 Gravitational acceleration on Earth
- Function: sinh, sinh(Number)

 The hyperbolic sine function, also known as the sinh function, is a mathematical function that is defined as the hyperbolic analogue of the sine function.
- Function: 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.
- Function: tan, tan(Angle)

 The tangent of an angle is a trigonometric ratio of the length of the side opposite an angle to the length of the side adjacent to an angle in a right triangle.
- Measurement: Length in Meter (m)
 Length Unit Conversion
- Measurement: Density in Kilogram per Cubic Meter (kg/m³)
 Density Unit Conversion





Check other formula lists

- Methods to Predict Channel Shoaling Formulas
- Nearshore Currents Formulas
- Wave Setup Formulas

Feel free to SHARE this document with your friends!

PDF Available in

English Spanish French German Russian Italian Portuguese Polish Dutch

6/20/2024 | 8:05:06 AM UTC

Please leave your feedback here...



