calculatoratoz.com

unitsconverters.com

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 🔗

Open Calculator 🔗

$$fx \quad \beta = \frac{\pi}{2} \cdot \left(\frac{R}{H_o} \cdot (2 \cdot \pi)^{0.5} \right)^4$$

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

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

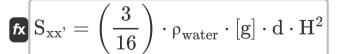**Open Calculator** 🔗

$$fx \quad \gamma_b = \sqrt{ \frac{8}{3} \cdot \left(\left(\frac{d_b}{\eta_s - \eta_b} \right) - 1 \right) }$$

$$ex \quad 0.335694 = \sqrt{ \frac{8}{3} \cdot \left(\left(\frac{55m}{53.0m - 0.23m} \right) - 1 \right) }$$

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

Open Calculator 🔗

$$fx \quad S_{xx'} = \left(\frac{3}{16} \right) \cdot \rho_{water} \cdot [g] \cdot d \cdot H^2$$

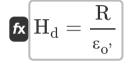$$ex \quad 17376.16 = \left(\frac{3}{16} \right) \cdot 1000kg/m^3 \cdot [g] \cdot 1.05m \cdot (3m)^2$$

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

fx $H_d = \dfrac{R}{(2 \cdot \pi)^{0.5} \cdot \left(\frac{\pi}{2} \cdot \beta\right)^{\frac{1}{4}}}$

ex $7.633201m = \dfrac{20m}{(2 \cdot \pi)^{0.5} \cdot \left(\frac{\pi}{2} \cdot 0.76\right)^{\frac{1}{4}}}$

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

fx $H_d = \dfrac{R}{\varepsilon_{o'}}$

ex $6.024096m = \dfrac{20m}{3.32}$

6) Mean Water Surface Elevation given Total Water Depth ⌁

fx $\eta' = H_c - h$

ex $29m = 49m - 20.0m$

7) Nonbreaking Upper Limit of Runup on Uniform Slope ⌁

fx $R = H_d \cdot (2 \cdot \pi)^{0.5} \cdot \left(\dfrac{\pi}{2 \cdot \beta}\right)^{\frac{1}{4}}$

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

8) Set down for Regular Waves 📲

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

Open Calculator 📲

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

9) Setdown at Breaker Point at Still-Water Shoreline 📲

$$fx \quad \eta_b = \eta_s - \left(\frac{1}{1 + \left(\frac{8}{3 \cdot \Upsilon_{b'}^2}\right)}\right) \cdot d_b$$

Open Calculator 📲

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

10) Setup at Mean Shoreline 📲

$$fx \quad \eta'_{max} = \eta_s + (d\eta'dx \cdot \Delta_x)$$

Open Calculator 📲

$$ex \quad 53.67764 = 53.0m + (0.012 \cdot 56.47)$$

11) Setup at Still-Water Shoreline ↗

Open Calculator ↗

$$\text{fx } \eta_s = \eta_b + \left(\cfrac{1}{1 + \left(\frac{8}{3 \cdot \Upsilon_{b'}^2} \right)} \right) \cdot d_b$$

$$\text{ex } 52.98171m = 0.23m + \left(\cfrac{1}{1 + \left(\frac{8}{3 \cdot (7.91)^2} \right)} \right) \cdot 55m$$

12) Shoreward Displacement of Shoreline ↗

Open Calculator ↗

$$\text{fx } \Delta_x = \frac{\eta_s}{\tan(\beta) - d\eta\text{'}dx}$$

$$\text{ex } 56.47602 = \frac{53.0m}{\tan(0.76) - 0.012}$$

13) Still Water Depth given Total Water Depth ↗

Open Calculator ↗

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

$$\text{ex } 20m = 49m - 29m$$

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

Open Calculator ⤢

$$fx \quad \varepsilon_{o'} = \frac{R}{H_d}$$

$$ex \quad 3.333333 = \frac{20m}{6.0m}$$

15) Total Water Depth ⤢

Open Calculator ⤢

$$fx \quad H_c = h + \eta'$$

$$ex \quad 49m = 20.0m + 29m$$

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

Open Calculator ⤢

$$fx \quad d_b = \frac{\eta_s - \eta_b}{1 + \left(\frac{8}{3 \cdot \Upsilon_{b'}^2}\right)}$$

$$ex \quad 55.01907m = \frac{53.0m - 0.23m}{1 + \left(\frac{8}{3 \cdot (7.91)^2}\right)}$$

17) Water Depth given Cross Shore Component ⤢

Open Calculator ⤢

$$fx \quad d = \frac{S_{xx'}}{\left(\frac{3}{16}\right) \cdot \rho_{water} \cdot [g] \cdot H^2}$$

$$ex \quad 1.04999m = \frac{17376}{\left(\frac{3}{16}\right) \cdot 1000 kg/m^3 \cdot [g] \cdot (3m)^2}$$

18) Wave Height given Cross-Shore Component ⤢

Open Calculator ⤢

$$fx \quad H = \sqrt{\frac{16 \cdot S_{xx'}}{3 \cdot \rho_{water} \cdot [g] \cdot d}}$$

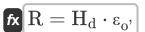$$ex \quad 2.999986m = \sqrt{\frac{16 \cdot 17376}{3 \cdot 1000 kg/m^3 \cdot [g] \cdot 1.05m}}$$

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

Open Calculator ⤢

$$fx \quad H = \sqrt{\eta'_o \cdot 8 \cdot \frac{\sinh\left(4 \cdot \pi \cdot \frac{d}{\lambda}\right)}{2 \cdot \frac{\pi}{\lambda}}}$$

$$ex \quad 2.986363m = \sqrt{0.51m \cdot 8 \cdot \frac{\sinh\left(4 \cdot \pi \cdot \frac{1.05m}{26.8m}\right)}{2 \cdot \frac{\pi}{26.8m}}}$$

20) Wave Runup above Mean Water Level C

Open Calculator C

fx $R = H_d \cdot \varepsilon_{o'}$

ex $19.92\text{m} = 6.0\text{m} \cdot 3.32$

Variables Used

- **d** Water Depth *(Meter)*
- **d_b** Water Depth at Breaking *(Meter)*
- **dη'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)*
- **H_o** Deepwater Wave Height of Ocean *(Meter)*
- **R** Wave Runup *(Meter)*
- **S_{xx}'** Coastal Cross-Shore Component
- **β** Beach Slope
- **$γ_b$** Breaker Depth Index
- **$Δ_x$** Shoreward Displacement of the Shoreline
- **$ε_o$'** 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)*
- **$ρ_{water}$** 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

4/11/2024 | 9:33:12 AM UTC

Please leave your feedback here...