Fully Developed Sea Wave Height, Period and Power from Wind

Significant wave height, peak and energy periods and wave power of a fully developed sea from the wind speed, by the Pierson-Moskowitz spectrum.

Method: Pierson–Moskowitz fully developed sea

Input parameters

Unit system: SI

Parameter	Value	Unit
Wind speed at 10 m	12.000	m/s
Seawater density	1,025.0	kg/m³

Calculated results

Parameter	Value	Unit
Wind speed at 19.5 m (1/7 power law)	13.201	m/s
Significant wave height	3.7319	m
Peak period	9.6444	s
Energy period	8.2652	s
Wave power per metre of crest	56.435	kW/m

Notes for this case

• Pierson–Moskowitz fully developed sea: H_s = 0.21U²/g, ω_p = 0.877g/U with U at 19.5 m; T_e ≈ 0.857T_p for this spectrum. Real seas are often fetch- or duration-limited and smaller; swell from distant storms adds energy.

Formula and method

$$H_s = 0.21\frac{U_{19.5}^2}{g}, \quad T_p = \frac{2\pi U_{19.5}}{0.877g}, \quad P_w = \frac{\rho g^2 H_s^2 T_e}{64\pi}$$

Variables

U_{10}	Wind speed at 10 m	m/s
ρ	Seawater density	kg/m³
$U_{19.5}$	Wind speed at 19.5 m (1/7 power law)	m/s
H_s	Significant wave height	m
T_p	Peak period	s
T_e	Energy period	s
P_w	Wave power per metre of crest	W/m

Method and standards

Wind-wave estimate.

Assumptions and limits

- Deep water; fully developed sea.

References

Pierson–Moskowitz fully developed sea

Report details

Report reference	FCC-SSZ7-QYJ6 (the same inputs always give the same reference)
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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/environmental/geothermal-ocean/fully-developed-sea-wave-height

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.