Hull Speed and Froude Number of a Displacement Hull

Froude number and speed-length ratio of a boat or ship, the classic displacement hull speed and the speed regime from the waterline length and speed.

Method: Froude number and wave-making speed regimes

Input parameters

Unit system: SI

Parameter	Value	Unit
Waterline length	9.0000	m
Speed	6.5000	kn

Calculated results

Parameter	Value	Unit
Froude number V/√(gL)	0.35593	
Speed-length ratio (knots, feet)	1.1962	
Hull speed (F_n = 0.40, speed-length ratio 1.34)	7.2865	kn
Length of the transverse wave at this speed 2πV²/g	7.1641	m

Notes for this case

- Below hull speed: wave resistance is rising quickly.

Formula and method

$$F_n = \frac{V}{\sqrt{gL_{WL}}}, \quad V_{hull} \approx 0.40\sqrt{gL_{WL}} = 1.34\sqrt{L_{WL,ft}}\ \text{kn}, \quad \lambda = \frac{2\pi V^2}{g}$$

Variables

L_{WL}	Waterline length	m
V	Speed	m/s
F_n	Froude number V/√(gL)	-
$V/\sqrt{L}$	Speed-length ratio (knots, feet)	-
V_{hull}	Hull speed (F_n = 0.40, speed-length ratio 1.34)	m/s
λ	Length of the transverse wave at this speed 2πV²/g	m

Method and standards

Froude scaling of wave-making resistance.

Assumptions and limits

- Deep water, displacement hull.

References

Froude number and wave-making speed regimes

Report details

Report reference	FCC-SH48-4SXX (the same inputs always give the same reference)
Generated	23 November 2026, 18:00 UTC
Calculator	Hull Speed and Froude Number of a Displacement Hull
Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 22 November 2026
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/mechanical/marine/hull-speed-froude-number

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.