Buoyancy, Apparent Weight and Draft of a Floating Body

Buoyancy and apparent weight of a submerged body, and the draft of a floating box or cylinder from its mass, dimensions and the liquid density.

Method: Archimedes' principle

Input parameters

Unit system: SI

Parameter	Value	Unit
Mass of the body	500.00	kg
Volume of the body	1.2000	m³
Liquid density	1,000.0	kg/m³
Waterplane area (for the draft of a vertical-sided body)	1.5000	m²

Calculated results

Parameter	Value	Unit
Buoyancy when fully submerged ρ g V	11.768	kN
Apparent weight when submerged (negative = it floats)	-6.8647	kN
Floats (1) or sinks (0)	1.0000	
Draft when floating m/(ρ A_w)	0.33333	m
Mean density of the body	416.67	kg/m³

Notes for this case

- Draft for a vertical-sided body (box or upright cylinder); stability (metacentric height) is a separate check.

Formula and method

$$F_B = \rho_l g V, \quad W_a = mg - F_B, \quad T = \frac{m}{\rho_l A_w}$$

Variables

m	Mass of the body	kg
V	Volume of the body	m³
ρ_l	Liquid density	kg/m³
A_w	Waterplane area (for the draft of a vertical-sided body)	m²
F_B	Buoyancy when fully submerged ρ g V	N
W_a	Apparent weight when submerged (negative = it floats)	N
floats	Floats (1) or sinks (0)	-
T	Draft when floating m/(ρ A_w)	m
ρ_b	Mean density of the body	kg/m³

Method and standards

Archimedes' principle.

Assumptions and limits

- Vertical-sided body for the draft; the draft is shown only when the body floats.

References

- Archimedes' principle

Report details

Report reference	FCC-AFX2-3WPP (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/mechanical/fluid-mechanics/buoyancy-floating-body

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.