Hydrostatic Pressure at Depth (Liquid Head)

Pressure at a depth in a liquid from density and head, as gauge and absolute pressure, with the force on a flat area at that depth.

Method: Hydrostatics (p = ρ g h)

Input parameters

Unit system: SI

Parameter	Value	Unit
Liquid density	1,000.0	kg/m³
Depth below the free surface (head)	10.000	m
Pressure on the free surface (absolute)	101.33	kPa
Area (horizontal) at that depth, for the force	1.0000	m²

Calculated results

Parameter	Value	Unit
Pressure from the liquid (gauge, above the surface pressure)	98.067	kPa
Absolute pressure	199.39	kPa
Force on the area from the liquid	98.067	kN
Specific gravity (water at 4 °C = 1)	1.0000	

Formula and method

$$p_g = \rho g h \qquad p = p_0 + p_g \qquad F = p_g A \qquad SG = \frac{\rho}{\rho_{w,4\,°C}}$$

Variables

ρ	liquid density	kg/m³
h	depth	m
p_0	surface pressure	Pa
A	area	m²
p_g	pressure from the liquid	Pa
p	absolute pressure	Pa
F	force on the area	N
SG	specific gravity	–
g	standard gravity	m/s²

Method and standards

Hydrostatic equation at standard gravity; reference water density from IAPWS-IF97 at 4 °C and 1 atm.

Assumptions and limits

- Incompressible liquid at rest; standard gravity.
- SG is against water at 4 °C (999.97 kg/m³). Petroleum practice uses water at 15.6 °C (60 °F), which gives SG about 0.1 % higher.

References

- Hydrostatics (p = ρ g h)

Report details

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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/hydrostatic-pressure

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.