Rectangular Tank Wall: Hydrostatic Force and Bending Moment

Resultant hydrostatic force on a vertical rectangular tank wall, its centre of pressure and the bending moment at the base of a cantilever wall per metre width.

Method: Hydrostatics (definitions)

Input parameters

Unit system: SI

Parameter	Value	Unit
Liquid depth	3.0000	m
Wall width	5.0000	m
Liquid density	1,000.0	kg/m³

Calculated results

Parameter	Value	Unit
Pressure at the base	29.420	kPa
Resultant force on the wall	220.65	kN
Centre of pressure above the base	1.0000	m
Base moment per metre width of wall, kN·m per m (cantilever)	44.130	kN·m

Notes for this case

- Cantilever wall fixed at the base and free at the top; walls supported at the sides or top carry less moment (plate theory).

Formula and method

$$F = \frac{\rho g H^2 b}{2}, \quad y_c = \frac{H}{3}, \quad M = \frac{\rho g H^3}{6}$$

Variables

H	Liquid depth	m
b	Wall width	m
ρ	Liquid density	kg/m³
p_{max}	Pressure at the base	Pa
F	Resultant force on the wall	N
y_c	Centre of pressure above the base	m
M	Base moment per metre width of wall (cantilever)	N·m/m

Method and standards

Hydrostatics.

Assumptions and limits

- Static liquid; vertical wall.
- The base moment is per metre width of wall and is shown in kN·m per metre in every unit system; multiply by the width for the whole wall.

References

- Hydrostatics (definitions)

Report details

Report reference	FCC-5FY8-Z9Q3 (the same inputs always give the same reference)
Generated	17 November 2026, 19:44 UTC
Calculator	Rectangular Tank Wall: Hydrostatic Force and Bending Moment
Method last reviewed	13 November 2026
Software release	FireCAD Calc, release of 17 November 2026
Release checks	2 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/vessels/rectangular-tank-wall-force

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.