Tank Level and Contents from Load Cells

Mass and level of liquid in a vertical tank weighed on load cells, from the gross weight, tare, liquid density and tank diameter, with the share per cell.

Method: Mass balance; level from volume of a vertical cylinder

Input parameters

Unit system: SI

Parameter	Value	Unit
Gross weight from the load cells	12,500	kg
Empty tank weight (tare)	2,500.0	kg
Liquid density	1,000.0	kg/m³
Tank inside diameter	2.5000	m
Number of load cells	3.0000	
Rated capacity of each cell	10,000	kg

Calculated results

Parameter	Value	Unit
Net liquid mass	10,000	kg
Liquid volume	10.000	m³
Level (vertical cylinder, flat bottom)	2.0372	m
Load on each cell (even share)	4,166.7	kg
Share of cell capacity used	41.667	%

Notes for this case

• Weighing measures mass directly, independent of density; level follows from the density. Keep pipes flexible so they do not carry load.

Formula and method

$$m = m_g - m_t, \quad V = \frac{m}{\rho}, \quad L = \frac{V}{\pi D^2/4}$$

Variables

m_g	Gross weight from the load cells	kg
m_t	Empty tank weight (tare)	kg
ρ	Liquid density	kg/m³
D	Tank inside diameter	m
n	Number of load cells	-
m_{cell}	Rated capacity of each cell	kg
m	Net liquid mass	kg
V	Liquid volume	m³
L	Level (vertical cylinder, flat bottom)	m
m_1	Load on each cell (even share)	kg
u	Share of cell capacity used	-

Method and standards

Mass balance.

Assumptions and limits

- Even sharing between cells; the page warns when the share of rated capacity passes 100 %. Wind, seismic load, shock and uneven sharing need further margin, set by the cell maker's guidance.
- Flat-bottom vertical tank.

References

- Mass balance; level from volume of a vertical cylinder

Report details

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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/instrumentation/pressure-level/tank-level-from-load-cells

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.