

Spherical Tank volume formula

tankvolumecalc.com/formulas/sphere-tank/

Total volume, exact partial fill, derivation, worked example and a copy-ready fill table.

TOTAL VOLUME

$$V = (4/3)\pi r^3$$

PARTIAL FILL AT LIQUID DEPTH H

$$V(h) = \pi h^2(3r-h)/3$$

Derivation

The spherical cap — derivable by integrating circular slices $\pi(2rh-h^2)dh$ from 0 to h. At half depth it gives exactly half the sphere; at 25% depth only ~15.6%, the strongest nonlinearity of any common tank.

Worked example

Take D = 100 in. Total capacity: 2,266.7 gal. At a stick reading of 40 in (40% of the 100 in maximum depth), the filled volume is 797.9 gal — 35.2% of capacity. Check it live on the calculator.

Fill ratio: % of depth → % of volume (any sphere (proportion-independent))

Depth	Volume
5%	0.7%
10%	2.8%
15%	6.1%
20%	10.4%
25%	15.6%
30%	21.6%
35%	28.2%
40%	35.2%
45%	42.5%
50%	50%
55%	57.5%
60%	64.8%
65%	71.8%
70%	78.4%
75%	84.4%
80%	89.6%
85%	93.9%
90%	97.2%
95%	99.3%

Need the full inch-by-inch table for specific dimensions? The dip chart generator prints it as a laminate-ready PDF.

FAQ

Q. What is the formula for a spherical tank volume?

Total: $V = (4/3)\pi r^3$. Partial fill at depth h: $V(h) = \pi h^2(3r-h)/3$. Derivation and a worked example are above.

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Q. Is the fill-ratio table exact?

Yes — computed by the same engine as our calculators (any sphere (proportion-independent)), verified by the automated test suite described on the methodology page.

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Q. Can I use this in a spreadsheet?

Yes — the formulas are closed-form (acos and sqrt only). Copy the 5%-step table for quick interpolation, or implement the formula directly for exact values.

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