Grain Bin or Silo Capacity with Peaked Fill

Volume and tonnage of grain in a cylindrical bin or silo with a conical peak at the angle of repose and an optional hopper bottom.

Method: Geometry of a cylindrical bin with conical peak and hopper

Input parameters

Unit system: SI

Parameter	Value	Unit
Bin diameter	6.0000	m
Height of grain at the wall (eave)	8.0000	m
Angle of repose of the grain	25.000	°
Hopper bottom angle from horizontal (0 = flat floor)	0	°
Bulk density of the grain	750.00	kg/m³

Calculated results

Parameter	Value	Unit
Cylinder volume	226.19	m³
Peak cone volume	13.185	m³
Hopper volume	0	m³
Total volume	239.38	m³
Grain mass	179.53	t
Peak height	1.3989	m

Notes for this case

• Grain filled from a central spout forms a cone at its angle of repose (about 25° for wheat and paddy, 28° for maize) above the wall height; a hopper bottom adds an inverted cone below it. Volume times bulk density gives the tonnage. Bulk density varies with moisture and packing (wheat 750–800, paddy 550–600, maize 700–750 kg/m³), and grain packs by a few per cent in deep bins.

Formula and method

$$V = \frac{\pi D^2}{4}\left(H + \frac{D\tan\theta}{6} + \frac{D\tan\alpha}{6}\right), \quad m = \rho_b V$$

Variables

D	Bin diameter	m
H	Height of grain at the wall (eave)	m
θ	Angle of repose of the grain	rad
α	Hopper bottom angle from horizontal (0 = flat floor)	rad
ρ_b	Bulk density of the grain	kg/m³
V_c	Cylinder volume	m³
V_p	Peak cone volume	m³
V_h	Hopper volume	m³
V	Total volume	m³
m	Grain mass	kg
h_p	Peak height	m

Method and standards

Grain bin.

Assumptions and limits

- Central filling; uniform bulk density.

References

Geometry of a cylindrical bin with conical peak and hopper

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/civil/irrigation-farm/grain-bin-capacity

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.