Swell Factor and Bank, Loose and Compacted Volumes

Percent swell and swell factor from bank and loose densities, the loose volume to haul for a bank volume, and the mass moved.

Input parameters

Unit system: SI

Parameter	Value	Unit
Bank density	2,650.0	kg/m³
Loose density	1,770.0	kg/m³
Bank volume	1,000.0	m³

Calculated results

Parameter	Value	Unit
Swell	49.718	%
Swell factor (bank per loose)	0.66792	
Loose volume	1,497.2	m³
Mass	2,650.0	t

Notes for this case

- Bank measure (BCM, BCY) is in place; loose measure (LCM, LCY) is in the bucket or truck. Production is usually quoted in bank units, so loose capacities are multiplied by the swell factor.

Formula and method

$$\text{swell} = \frac{BD}{LD} - 1, \quad SF = \frac{1}{1+\text{swell}} = \frac{LD}{BD}, \quad V_l = V_b(1+\text{swell})$$

Variables

BD	Bank density	kg/m³
LD	Loose density	kg/m³
V_b	Bank volume	m³
swell	Swell	-
SF	Swell factor (bank per loose)	-
V_l	Loose volume	m³
m	Mass	kg

Method and standards

Bank and loose volume relations.

Assumptions and limits

- Densities are averages for the material.

Report details

Report reference	FCC-2C3T-0S5S (the same inputs always give the same reference)
Generated	23 November 2026, 17:26 UTC
Calculator	Swell Factor and Bank, Loose and Compacted Volumes
Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 22 November 2026
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/mine-design/swell-bank-loose-volume

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.