Infinite Slope Stability: Factor of Safety

Factor of safety of a long natural slope against shallow sliding from slope angle, depth, soil strength and the water table (dry, partly or fully seeping).

Method: Infinite slope analysis with slope-parallel seepage (Das; Duncan and Wright, Soil Strength and Slope Stability)

Input parameters

Unit system: SI

Parameter	Value	Unit
Slope angle	25.000	°
Depth of the slip plane	3.0000	m
Effective cohesion	5.0000	kPa
Effective friction angle	32.000	°
Unit weight of the soil	19.000	kN/m³
Height of the water table above the slip plane, share of z 0 dry, 1 seepage at the surface, parallel to the slope.	50.000	%

Calculated results

Parameter	Value	Unit
Shear stress on the plane	21.832	kPa
Effective normal stress	34.737	kPa
Factor of safety	1.2232	

Notes for this case

- Uses the soil's single unit weight above and below the water table; for slope design use a full slope stability method.

Formula and method

The formula is shown on the calculator page: https://calc.firecad.com/civil/geotechnical/infinite-slope-stability

Variables

β	Slope angle	rad
z	Depth of the slip plane	m
c'	Effective cohesion	Pa
\phi'	Effective friction angle	rad
γ	Unit weight of the soil	N/m³
m	Height of the water table above the slip plane, share of z	-
τ	Shear stress on the plane	Pa
\sigma'_n	Effective normal stress	Pa
FS	Factor of safety	-

Method and standards

Limit equilibrium on a plane parallel to the slope.

Assumptions and limits

- Long uniform slope.

References

- Infinite slope analysis with slope-parallel seepage (Das; Duncan and Wright, Soil Strength and Slope Stability)

Report details

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Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/civil/geotechnical/infinite-slope-stability

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.