# Important Stability Analysis of Infinite Slopes Formulas PDF

**Formulas**
**Examples**
**with Units**

## List of 37
### Important Stability Analysis of Infinite Slopes Formulas

### 1) Angle of Internal Friction given Factor of Safety for Cohesive Soil Formula

Evaluate Formula

Formula

$$\Phi_i = atan\left(\frac{\left(\tau_{Shearstress} \cdot f_s\right) - c_u}{\sigma_{Normal}}\right)$$

Example with Units

$$78.6898° = atan\left(\frac{\left(15.909\,Pa \cdot 0.88\right) - 10\,Pa}{0.8\,Pa}\right)$$

### 2) Angle of Internal Friction given Shear Strength of Cohesionless Soil Formula

Evaluate Formula

Formula

$$\varphi = atan\left(\frac{\tau_s}{\sigma_{nm}}\right)$$

Example with Units

$$47.4896° = atan\left(\frac{1.2\,MPa}{1.1\,MPa}\right)$$

### 3) Angle of Internal Friction given Shear Strength of Cohesive Soil Formula

Evaluate Formula

Formula

$$\Phi_c = atan\left(\frac{\tau_s - c_u}{\sigma_{Normal}}\right)$$

Example with Units

$$90° = atan\left(\frac{1.2\,MPa - 10\,Pa}{0.8\,Pa}\right)$$

### 4) Angle of Internal Friction given Shear Strength of Soil Formula

Evaluate Formula

Formula

$$\Phi_i = atan\left(\left(\frac{\tau_s}{\tau}\right) \cdot \tan\left(\left(I\right)\right)\right)$$

Example with Units

$$89.9995° = atan\left(\left(\frac{1.2\,MPa}{61\,Pa}\right) \cdot \tan\left(\left(80°\right)\right)\right)$$

### 5) Cohesion given Critical Depth for Cohesive Soil Formula

Evaluate Formula

Formula

$$c = \left(h_c \cdot \gamma \cdot \left(\tan\left(\left(I\right)\right) - \tan\left(\left(\varphi\right)\right)\right) \cdot \left(\cos\left(\left(I\right)\right)\right)^2\right)$$

Example with Units

$$2.5111\,kPa = \left(1.01\,m \cdot 18\,kN/m^3 \cdot \left(\tan\left(\left(80°\right)\right) - \tan\left(\left(47.48°\right)\right)\right) \cdot \left(\cos\left(\left(80°\right)\right)\right)^2\right)$$

## 6) Cohesion given Shear Strength of Cohesive Soil Formula

Evaluate Formula

Formula

$$c = \tau_f - \left( \sigma_n \cdot \tan\left( \frac{\Phi_i \cdot \pi}{180} \right) \right)$$

Example with Units

$$4.4007\,\text{kPa} = 4.92\,\text{kN/m}^2 - \left( 21.66\,\text{kN/m}^2 \cdot \tan\left( \frac{78.69^\circ \cdot 3.1416}{180} \right) \right)$$

## 7) Cohesion given Stability Number for Cohesive Soil Formula

Evaluate Formula

Formula

$$c = S_n \cdot \left( \gamma \cdot h_{cs} \right)$$

Example with Units

$$2.4964\,\text{kPa} = 2.01 \cdot \left( 18\,\text{kN/m}^3 \cdot 0.069\,\text{m} \right)$$

## 8) Cohesion of Soil given Factor of Safety for Cohesive Soil Formula

Evaluate Formula

Formula

$$c = \left( \zeta_{cs} \cdot f_s \right) - \left( \sigma_n \cdot \tan\left( \left( \varphi \right) \right) \right)$$

Example with Units

$$2.5324\,\text{kPa} = \left( 29.72\,\text{kN/m}^2 \cdot 0.88 \right) - \left( 21.66\,\text{kN/m}^2 \cdot \tan\left( \left( 47.48^\circ \right) \right) \right)$$

## 9) Cohesion of Soil given Factor of Safety with respect to Cohesion Formula

Evaluate Formula

Formula

$$c = \left( S_n \cdot F_c \cdot \gamma \cdot H_{Mobilised} \right)$$

Example with Units

$$2.7497\,\text{kPa} = \left( 2.01 \cdot 1.9 \cdot 18\,\text{kN/m}^3 \cdot 0.04\,\text{m} \right)$$

## 10) Cohesion of Soil given Mobilized Cohesion Formula

Evaluate Formula

Formula

$$c = C_m \cdot F_c$$

Example with Units

$$2.511\,\text{kPa} = 1321.59\,\text{Pa} \cdot 1.9$$

## 11) Critical Depth for Cohesive Soil Formula

Evaluate Formula

Formula

$$h_c = \frac{c}{\gamma \cdot \left( \tan\left( \left( I \right) \right) - \tan\left( \left( \varphi \right) \right) \right) \cdot \left( \cos\left( \left( I \right) \right) \right)^2}$$

Example with Units

$$1.0099\,\text{m} = \frac{2.511\,\text{kPa}}{18\,\text{kN/m}^3 \cdot \left( \tan\left( \left( 80^\circ \right) \right) - \tan\left( \left( 47.48^\circ \right) \right) \right) \cdot \left( \cos\left( \left( 80^\circ \right) \right) \right)^2}$$

## 12) Critical Depth for Cohesive Soil given Factor of Safety Formula

Evaluate Formula

Formula

$$h_{Critical} = F_c \cdot H$$

Example with Units

$$5.51\,\text{m} = 1.9 \cdot 2.9\,\text{m}$$

## 13) Critical Depth given Stability Number for Cohesive Soil Formula

Evaluate Formula

Formula

$$h_{cs} = \left(\frac{c}{\gamma \cdot S_n}\right)$$

Example with Units

$$0.0694\,\text{m} = \left(\frac{2.511\,\text{kPa}}{18\,\text{kN/m}^3 \cdot 2.01}\right)$$

## 14) Depth at Mobilized Cohesion Formula

Evaluate Formula

Formula

$$H = \left(\frac{C_c}{\gamma \cdot S_n}\right)$$

Example with Units

$$2.9\,\text{m} = \left(\frac{104.922\,\text{Pa}}{18\,\text{kN/m}^3 \cdot 2.01}\right)$$

## 15) Depth of Mobilized Cohesion given Critical Depth Formula

Evaluate Formula

Formula

$$H = \frac{h_{Critical}}{F_c}$$

Example with Units

$$2.9\,\text{m} = \frac{5.51\,\text{m}}{1.9}$$

## 16) Depth of Mobilized Cohesion given Factor of Safety Formula

Evaluate Formula

Formula

$$H_{Mobilised} = \left(\frac{c}{S_n \cdot \gamma \cdot F_c}\right)$$

Example with Units

$$0.0365\,\text{m} = \left(\frac{2.511\,\text{kPa}}{2.01 \cdot 18\,\text{kN/m}^3 \cdot 1.9}\right)$$

## 17) Factor of Safety against Sliding Formula

Evaluate Formula

Formula

$$f_s = \left(\frac{\tan\left(\left(\Phi_i\right)\right)}{\tan\left(\left(I\right)\right)}\right)$$

Example with Units

$$0.8816 = \left(\frac{\tan\left(\left(78.69°\right)\right)}{\tan\left(\left(80°\right)\right)}\right)$$

## 18) Factor of Safety given Critical Depth Formula

Evaluate Formula

Formula

$$F_c = \frac{h_{Critical}}{H}$$

Example with Units

$$1.9 = \frac{5.51\,\text{m}}{2.9\,\text{m}}$$

## 19) Factor of Safety given Stability Number Formula

Evaluate Formula

Formula

$$F_c = \left( \frac{c}{S_n \cdot \gamma \cdot H_{Mobilised}} \right)$$

Example with Units

$$1.7351 = \left( \frac{2.511\,\text{kPa}}{2.01 \cdot 18\,\text{kN/m}^3 \cdot 0.04\,\text{m}} \right)$$

## 20) Mobilized Cohesion Formula

Evaluate Formula

Formula

$$C_m = \frac{c}{F_c}$$

Example with Units

$$1321.5789\,\text{Pa} = \frac{2.511\,\text{kPa}}{1.9}$$

## 21) Mobilized Cohesion given Stability Number for Cohesive Soil Formula

Evaluate Formula

Formula

$$C_c = \left( S_n \cdot \gamma \cdot H \right)$$

Example with Units

$$104.922\,\text{Pa} = \left( 2.01 \cdot 18\,\text{kN/m}^3 \cdot 2.9\,\text{m} \right)$$

## 22) Normal Stress given Factor of Safety for Cohesive Soil Formula

Evaluate Formula

Formula

$$\sigma_{Normal} = \frac{\left( \tau_{Shearstress} \cdot f_s \right) - c_u}{\tan\left( \left( \Phi_i \right) \right)}$$

Example with Units

$$0.8\,\text{Pa} = \frac{\left( 15.909\,\text{Pa} \cdot 0.88 \right) - 10\,\text{Pa}}{\tan\left( \left( 78.69° \right) \right)}$$

## 23) Normal Stress given Shear Strength of Cohesionless Soil Formula

Evaluate Formula

Formula

$$\sigma_{nm} = \frac{\tau_s}{\tan\left( \left( \varphi \right) \right)}$$

Example with Units

$$1.1004\,\text{MPa} = \frac{1.2\,\text{MPa}}{\tan\left( \left( 47.48° \right) \right)}$$

## 24) Normal Stress given Shear Strength of Cohesive Soil Formula

Evaluate Formula

Formula

$$\sigma_{nm} = \frac{\tau_s - c}{\tan\left( \left( \varphi \right) \right)}$$

Example with Units

$$1.0981\,\text{MPa} = \frac{1.2\,\text{MPa} - 2.511\,\text{kPa}}{\tan\left( \left( 47.48° \right) \right)}$$

## 25) Normal Stress given Shear Stress of Cohesionless Soil Formula

Evaluate Formula

Formula

$$\sigma_{nm} = \tau_{Shearstress} \cdot \cot\left( \left( I \right) \right)$$

Example with Units

$$2.8052\,\text{MPa} = 15.909\,\text{Pa} \cdot \cot\left( \left( 80° \right) \right)$$

## 26) Shear Strength of Cohesionless Soil Formula

Evaluate Formula

Formula

$$\tau_s = \sigma_{nm} \cdot \tan\left( \left( \varphi \right) \right)$$

Example with Units

$$1.1996\,\text{MPa} = 1.1\,\text{MPa} \cdot \tan\left( \left( 47.48° \right) \right)$$

## 27) Shear Strength of Cohesive Soil Formula

Evaluate Formula

Formula

$$\tau_s = c + \left(\sigma_{nm} \cdot \tan\left(\left(\varphi\right)\right)\right)$$

Example with Units

$$1.2021\,\text{MPa} = 2.511\,\text{kPa} + \left(1.1\,\text{MPa} \cdot \tan\left(\left(47.48°\right)\right)\right)$$

## 28) Shear Strength of Soil given Angle of Internal Friction Formula

Evaluate Formula

Formula

$$\tau_{soil} = \left(\tau_{Shearstress} \cdot \left(\frac{\tan\left(\Phi_i\right)}{\tan\left(I\right)}\right)\right)$$

Example with Units

$$14.0258\,\text{MPa} = \left(15.909\,\text{Pa} \cdot \left(\frac{\tan\left(78.69°\right)}{\tan\left(80°\right)}\right)\right)$$

## 29) Shear Stress given Factor of Safety for Cohesive Soil Formula

Evaluate Formula

Formula

$$\tau_{Shearstress} = \frac{c_u + \left(\sigma_{Normal} \cdot \tan\left(\left(\Phi_i\right)\right)\right)}{f_s}$$

Example with Units

$$15.9091\,\text{Pa} = \frac{10\,\text{Pa} + \left(0.8\,\text{Pa} \cdot \tan\left(\left(78.69°\right)\right)\right)}{0.88}$$

## 30) Shear Stress of Soil given Angle of Internal Friction Formula

Evaluate Formula

Formula

$$\tau_i = \frac{\tau_s}{\frac{\tan\left(\left(\varphi\right)\right)}{\tan\left(\left(I\right)\right)}}$$

Example with Units

$$6.2405\,\text{Pa} = \frac{1.2\,\text{MPa}}{\frac{\tan\left(\left(47.48°\right)\right)}{\tan\left(\left(80°\right)\right)}}$$

## 31) Stability Number for Cohesive Soil Formula

Evaluate Formula

Formula

$$S_n = \left(\frac{c}{\gamma \cdot h_{cs}}\right)$$

Example with Units

$$2.0217 = \left(\frac{2.511\,\text{kPa}}{18\,\text{kN/m}^3 \cdot 0.069\,\text{m}}\right)$$

## 32) Stability Number for Cohesive Soil given Mobilized Cohesion Formula

Evaluate Formula

Formula

$$S_n = \left(\frac{C_c}{\gamma \cdot H}\right)$$

Example with Units

$$2.01 = \left(\frac{104.922\,\text{Pa}}{18\,\text{kN/m}^3 \cdot 2.9\,\text{m}}\right)$$

## 33) Stability Number given Factor of Safety Formula

Evaluate Formula

Formula

$$S_n = \left( \frac{c}{F_c \cdot \gamma \cdot H_{Mobilised}} \right)$$

Example with Units

$$1.8355 = \left( \frac{2.511\,\text{kPa}}{1.9 \cdot 18\,\text{kN/m}^3 \cdot 0.04\,\text{m}} \right)$$

## 34) Unit Weight of Soil given Critical Depth for Cohesive Soil Formula

Evaluate Formula

Formula

$$\gamma = \frac{c}{h_c \cdot \left( \tan\left( \left( I \right) \right) - \tan\left( \left( \varphi \right) \right) \right) \cdot \left( \cos\left( \left( I \right) \right) \right)^2}$$

Example with Units

$$17.999\,\text{kN/m}^3 = \frac{2.511\,\text{kPa}}{1.01\,\text{m} \cdot \left( \tan\left( \left( 80° \right) \right) - \tan\left( \left( 47.48° \right) \right) \right) \cdot \left( \cos\left( \left( 80° \right) \right) \right)^2}$$

## 35) Unit Weight of Soil given Factor of Safety Formula

Evaluate Formula

Formula

$$\gamma = \left( \frac{c}{S_n \cdot H_{Mobilised} \cdot F_c} \right)$$

Example with Units

$$16.4375\,\text{kN/m}^3 = \left( \frac{2.511\,\text{kPa}}{2.01 \cdot 0.04\,\text{m} \cdot 1.9} \right)$$

## 36) Unit Weight of Soil given Mobilized Cohesion Formula

Evaluate Formula

Formula

$$\gamma = \left( \frac{C_c}{S_n \cdot H} \right)$$

Example with Units

$$18\,\text{kN/m}^3 = \left( \frac{104.922\,\text{Pa}}{2.01 \cdot 2.9\,\text{m}} \right)$$

## 37) Unit Weight of Soil given Stability Number for Cohesive Soil Formula

Evaluate Formula

Formula

$$\gamma = \left( \frac{c}{S_n \cdot h_{cs}} \right)$$

Example with Units

$$18.1051\,\text{kN/m}^3 = \left( \frac{2.511\,\text{kPa}}{2.01 \cdot 0.069\,\text{m}} \right)$$

## Variables used in list of Stability Analysis of Infinite Slopes Formulas above

- **c** Cohesion of Soil *(Kilopascal)*
- $C_c$ Mobilized Cohesion for Cohesive Soil *(Pascal)*
- $C_m$ Mobilized Cohesion *(Pascal)*
- $c_u$ Unit Cohesion *(Pascal)*
- $F_c$ Factor of Safety with respect to Cohesion
- $f_s$ Factor of Safety
- **H** Depth at Mobilized Cohesion *(Meter)*
- $h_c$ Critical Depth *(Meter)*
- $h_{Critical}$ Critical Depth for Factor of Safety *(Meter)*
- $h_{cs}$ Critical Depth for Stability Number *(Meter)*
- $H_{Mobilised}$ Depth at Mobilized Cohesion in Stability Number *(Meter)*
- **I** Angle of Inclination *(Degree)*
- $S_n$ Stability Number
- $\gamma$ Unit Weight of Soil *(Kilonewton per Cubic Meter)*
- $\zeta_{cs}$ Shear Stress in Cohesive Soil *(Kilonewton per Square Meter)*
- $\sigma_n$ Normal Stress at a Point in Soil *(Kilonewton per Square Meter)*
- $\sigma_{nm}$ Normal Stress in Mega Pascal *(Megapascal)*
- $\sigma_{Normal}$ Normal Stress *(Pascal)*
- $\tau_f$ Shear Strength in KN per Cubic Meter *(Kilonewton per Square Meter)*
- $\tau_s$ Shear Strength *(Megapascal)*
- $\tau_{soil}$ Shear Strength of Soil *(Megapascal)*
- $\varphi$ Angle of Internal Friction *(Degree)*
- $\Phi_c$ Angle of Internal Friction of Cohesive Soil *(Degree)*
- $\Phi_i$ Angle of Internal Friction of Soil *(Degree)*
- $\tau$ Shear Stress *(Pascal)*

## Constants, Functions, Measurements used in list of Stability Analysis of Infinite Slopes Formulas above

- constant(s): **pi**, 3.14159265358979323846264338327950288 *Archimedes' constant*
- Functions: **atan**, atan(Number) *Inverse tan is used to calculate the angle by applying the tangent ratio of the angle, which is the opposite side divided by the adjacent side of the right triangle.*
- Functions: **cos**, cos(Angle) *Cosine of an angle is the ratio of the side adjacent to the angle to the hypotenuse of the triangle.*
- Functions: **cot**, cot(Angle) *Cotangent is a trigonometric function that is defined as the ratio of the adjacent side to the opposite side in a right triangle.*
- Functions: **tan**, tan(Angle) *The tangent of an angle is a trigonometric ratio of the length of the side opposite an angle to the length of the side adjacent to an angle in a right triangle.*
- Measurement: **Length** in Meter (m) *Length Unit Conversion*
- Measurement: **Pressure** in Pascal (Pa), Megapascal (MPa), Kilopascal (kPa) *Pressure Unit Conversion*
- Measurement: **Angle** in Degree (°) *Angle Unit Conversion*
- Measurement: **Specific Weight** in Kilonewton per Cubic Meter (kN/m³) *Specific Weight Unit Conversion*
- Measurement: **Stress** in Pascal (Pa), Kilonewton per Square Meter (kN/m²) *Stress Unit Conversion*

- $\tau_i$ Shear Stress given Angle of Internal Friction *(Pascal)*
- $\tau_{Shearstress}$ Shear Stress for Factor of Safety *(Pascal)*

## Download other Important Geotechnical Engineering PDFs

- Important Bearing Capacity for Strip Footing for C Φ Soils Formulas
- Important Bearing Capacity of Cohesive Soil Formulas
- Important Bearing Capacity of Non cohesive Soil Formulas
- Important Bearing Capacity of Soils Formulas
- Important Bearing Capacity of Soils by Meyerhof's Analysis Formulas
- Important Foundation Stability Analysis Formulas
- Important Atterberg Limits Formulas
- Important Bearing Capacity of Soil by Terzaghi's Analysis Formulas
- Important Compaction of Soil Formulas
- Important Earth Moving Formulas
- Important Lateral Pressure for Cohesive and Non Cohesive Soil Formulas
- Important Minimum Depth of Foundation by Rankine's Analysis Formulas
- Important Pile Foundations Formulas
- Important Porosity of Soil Sample Formulas
- Important Scraper Production Formulas
- Important Seepage Analysis Formulas
- Important Slope Stability Analysis using Bishops Method Formulas
- Important Slope Stability Analysis using Culman's Method Formulas
- Important Soil Origin and Its Properties Formulas
- Important Specific Gravity of Soil Formulas
- Important Stability Analysis of Infinite Slopes Formulas
- Important Stability Analysis of Infinite Slopes in Prism Formulas
- Important Vibration Control in Blasting Formulas
- Important Void Ratio of Soil Sample Formulas
- Important Water Content of Soil and Related Formulas

## Try our Unique Visual Calculators

- Reverse percentage
- HCF calculator
- Simple fraction

*9/18/2024 | 11:49:44 AM UTC*