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Stability Analysis of Infinite Slopes Formulas

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List of 37 Stability Analysis of Infinite Slopes Formulas

Stability Analysis of Infinite Slopes

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

Open Calculator

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

ex $$78.68985^\circ = a\tan\left(\frac{(15.909Pa\cdot 0.88)-10Pa}{0.8Pa}\right)$$

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

Open Calculator

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

ex $$47.48955^\circ = a\tan\left(\frac{1.2MPa}{1.1MPa}\right)$$

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

Open Calculator

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

ex $$89.99996^\circ = a\tan\left(\frac{1.2MPa - 10Pa}{0.8Pa}\right)$$

4) Angle of Internal Friction given Shear Strength of Soil

Open Calculator

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

ex $$89.99949^\circ = a\tan\left(\left(\frac{1.2\text{MPa}}{61\text{Pa}}\right)\cdot\tan((80^\circ))\right)$$

5) Cohesion given Critical Depth for Cohesive Soil

Open Calculator

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

ex $$2.511133\text{kPa} = \left(1.01\text{m}\cdot 18\text{kN/m}^3\cdot(\tan((80^\circ))-\tan((47.48^\circ)))\cdot(\cos((80^\circ)))^2\right)$$

6) Cohesion given Shear Strength of Cohesive Soil

Open Calculator

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

ex $$4.400703\text{kPa} = 4.92\text{kN/m}^2 - \left(21.66\text{kN/m}^2\cdot\tan\left(\frac{78.69^\circ\cdot\pi}{180}\right)\right)$$

7) Cohesion given Stability Number for Cohesive Soil

Open Calculator

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

ex $$2.49642\text{kPa} = 2.01\cdot(18\text{kN/m}^3\cdot 0.069\text{m})$$

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

Open Calculator

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

ex $$2.532417\text{kPa} = (29.72\text{kN/m}^2\cdot 0.88) - (21.66\text{kN/m}^2\cdot\tan((47.48^\circ)))$$

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

Open Calculator

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

$$2.74968\text{kPa} = (2.01 \cdot 1.9 \cdot 18\text{kN/m}^3 \cdot 0.04\text{m})$$

10) Cohesion of Soil given Mobilized Cohesion

Open Calculator

$$c = C_m \cdot F_c$$

$$2.511021\text{kPa} = 1321.59\text{Pa} \cdot 1.9$$

11) Critical Depth for Cohesive Soil

Open Calculator

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

$$1.009946\text{m} = \frac{2.511\text{kPa}}{18\text{kN/m}^3 \cdot (\tan((80^\circ)) - \tan((47.48^\circ))) \cdot (\cos((80^\circ)))^2}$$

12) Critical Depth for Cohesive Soil given Factor of Safety

Open Calculator

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

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

13) Critical Depth given Stability Number for Cohesive Soil

Open Calculator

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

$$0.069403\text{m} = \left(\frac{2.511\text{kPa}}{18\text{kN/m}^3 \cdot 2.01}\right)$$

14) Depth at Mobilized Cohesion

Open Calculator

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

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

15) Depth of Mobilized Cohesion given Critical Depth

Open Calculator

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

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

16) Depth of Mobilized Cohesion given Factor of Safety

Open Calculator

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

$$0.036528\text{m} = \left(\frac{2.511\text{kPa}}{2.01 \cdot 18\text{kN/m}^3 \cdot 1.9} \right)$$

17) Factor of Safety against Sliding

Open Calculator

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

$$0.88163 = \left(\frac{\tan((78.69^\circ))}{\tan((80^\circ))} \right)$$

18) Factor of Safety given Critical Depth

Open Calculator

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

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

19) Factor of Safety given Stability Number

Open Calculator

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

$$1.735075 = \left(\frac{2.511kPa}{2.01 \cdot 18kN/m^3 \cdot 0.04m} \right)$$

20) Mobilized Cohesion

Open Calculator

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

$$1321.579Pa = \frac{2.511kPa}{1.9}$$

21) Mobilized Cohesion given Stability Number for Cohesive Soil

Open Calculator

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

$$104.922Pa = (2.01 \cdot 18kN/m^3 \cdot 2.9m)$$

22) Normal Stress given Factor of Safety for Cohesive Soil

Open Calculator

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

$$0.799989Pa = \frac{(15.909Pa \cdot 0.88) - 10Pa}{\tan((78.69°))}$$

23) Normal Stress given Shear Strength of Cohesionless Soil

Open Calculator

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

ex $1.100368\text{MPa} = \frac{1.2\text{MPa}}{\tan((47.48^\circ))}$

24) Normal Stress given Shear Strength of Cohesive Soil

Open Calculator

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

ex $1.098066\text{MPa} = \frac{1.2\text{MPa} - 2.511\text{kPa}}{\tan((47.48^\circ))}$

25) Normal Stress given Shear Stress of Cohesionless Soil

Open Calculator

fx $\sigma_{nm} = \tau_{\text{Shearstress}} \cdot \cot((I))$

ex $2.805186\text{MPa} = 15.909\text{Pa} \cdot \cot((80^\circ))$

26) Shear Strength of Cohesionless Soil

Open Calculator

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

ex $1.199598\text{MPa} = 1.1\text{MPa} \cdot \tan((47.48^\circ))$

27) Shear Strength of Cohesive Soil

Open Calculator

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

ex $1.202109\text{MPa} = 2.511\text{kPa} + (1.1\text{MPa} \cdot \tan((47.48^\circ)))$

28) Shear Strength of Soil given Angle of Internal Friction

Open Calculator

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

$$14.02584\text{MPa} = \left(15.909\text{Pa} \cdot \left(\frac{\tan(78.69^\circ)}{\tan(80^\circ)}\right)\right)$$

29) Shear Stress given Factor of Safety for Cohesive Soil

Open Calculator

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

$$15.90906\text{Pa} = \frac{10\text{Pa} + (0.8\text{Pa} \cdot \tan((78.69^\circ)))}{0.88}$$

30) Shear Stress of Soil given Angle of Internal Friction

Open Calculator

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

$$6.240498\text{Pa} = \frac{1.2\text{MPa}}{\frac{\tan((47.48^\circ))}{\tan((80^\circ))}}$$

31) Stability Number for Cohesive Soil

Open Calculator

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

$$2.021739 = \left(\frac{2.511\text{kPa}}{18\text{kN/m}^3 \cdot 0.069\text{m}}\right)$$

32) Stability Number for Cohesive Soil given Mobilized Cohesion

Open Calculator

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

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

33) Stability Number given Factor of Safety

Open Calculator

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

$$1.835526 = \left(\frac{2.511\text{kPa}}{1.9 \cdot 18\text{kN/m}^3 \cdot 0.04\text{m}} \right)$$

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

Open Calculator

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

$$17.99904\text{kN/m}^3 = \frac{2.511\text{kPa}}{1.01\text{m} \cdot (\tan((80^\circ)) - \tan((47.48^\circ))) \cdot (\cos((80^\circ)))^2}$$

35) Unit Weight of Soil given Factor of Safety

Open Calculator

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

$$16.43755\text{kN/m}^3 = \left(\frac{2.511\text{kPa}}{2.01 \cdot 0.04\text{m} \cdot 1.9} \right)$$

36) Unit Weight of Soil given Mobilized Cohesion

Open Calculator

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

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

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

Open Calculator

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

ex $$18.10513\text{kN/m}^3 = \left(\frac{2.511\text{kPa}}{2.01 \cdot 0.069\text{m}} \right)$$

Variables Used

- **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
- **γ** Unit Weight of Soil *(Kilonewton per Cubic Meter)*
- **ζ_{cs}** Shear Stress in Cohesive Soil *(Kilonewton per Square Meter)*
- **σ_n** Normal Stress at a Point in Soil *(Kilonewton per Square Meter)*
- **σ_{nm}** Normal Stress in Mega Pascal *(Megapascal)*
- **σ_{Normal}** Normal Stress *(Pascal)*
- **τ_f** Shear Strength in KN per Cubic Meter *(Kilonewton per Square Meter)*
- **τ_s** Shear Strength *(Megapascal)*
- **τ_{soil}** Shear Strength of Soil *(Megapascal)*
- **φ** Angle of Internal Friction *(Degree)*
- **Φ_c** Angle of Internal Friction of Cohesive Soil *(Degree)*
- **Φ_i** Angle of Internal Friction of Soil *(Degree)*

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

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Function: **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.
- Function: **cos**, cos(Angle)
  Cosine of an angle is the ratio of the side adjacent to the angle to the hypotenuse of the triangle.
- Function: **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.
- Function: **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

Check other formula lists

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

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