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Taylor's Stability Number and Stability Curves Formulas

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List of 18 Taylor's Stability Number and Stability Curves Formulas

Taylor's Stability Number and Stability Curves

1) Angle of Internal Friction given Factor of Safety

Open Calculator

fx $$\varphi = a\tan\left(\frac{f_s \cdot \gamma_{sat} \cdot \tan((\varphi_{IF}))}{\gamma'}\right)$$

ex $$9.938374^\circ = a\tan\left(\frac{2.8 \cdot 9.98\text{N/m}^3 \cdot \tan((11^\circ))}{31\text{N/m}^3}\right)$$

2) Angle of Internal Friction given Weighted Friction Angle

Open Calculator

fx $$\varphi_{iw} = \frac{\varphi_w \cdot \gamma_{sat}}{\gamma'}$$

ex $$41.85161^\circ = \frac{130^\circ \cdot 9.98\text{N/m}^3}{31\text{N/m}^3}$$

3) Effective Angle of Internal Friction given Weighted Friction Angle

Open Calculator

fx $$\varphi' = \frac{\varphi_{IF}}{\frac{\gamma'}{f_s \cdot \gamma_{sat}}}$$

ex $$9.915613^\circ = \frac{11^\circ}{\frac{31\text{N/m}^3}{2.8 \cdot 9.98\text{N/m}^3}}$$

4) Factor of Safety with respect to Shear Strength

Open Calculator

fx $$f_s = \left(\left(\frac{\gamma'}{\gamma_{sat}} \right) \cdot \left(\frac{\tan((\varphi))}{\tan((\varphi_{IF}))} \right) \right)$$

ex $$2.797593 = \left(\left(\frac{31\text{N/m}^3}{9.98\text{N/m}^3} \right) \cdot \left(\frac{\tan((9.93^\circ))}{\tan((11^\circ))} \right) \right)$$

5) Factor of Safety with respect to Shear Strength given Weighted Friction Angle

Open Calculator

fx $$f_s = \frac{\gamma' \cdot \varphi'}{\varphi_{IF} \cdot \gamma_{sat}}$$

ex $$2.821006 = \frac{31\text{N/m}^3 \cdot 9.99^\circ}{11^\circ \cdot 9.98\text{N/m}^3}$$

6) Mobilized Friction Angle given Weighted Friction Angle

Open Calculator

$$\varphi_m = \frac{\gamma_{sat} \cdot \varphi_w}{\gamma'}$$

$$41.85161^\circ = \frac{9.98\text{N/m}^3 \cdot 130^\circ}{31\text{N/m}^3}$$

7) Saturated Unit Weight given Factor of Safety with respect to Shear Strength

Open Calculator

$$\gamma_{sat} = \left(\left(\frac{\gamma'}{\tan((\varphi_{IF}))}\right) \cdot \left(\frac{\tan((\varphi))}{f_s}\right)\right)$$

$$9.97142\text{N/m}^3 = \left(\left(\frac{31\text{N/m}^3}{\tan((11^\circ))}\right) \cdot \left(\frac{\tan((9.93^\circ))}{2.8}\right)\right)$$

8) Saturated Unit Weight given Weighted and Effective Friction Angle

Open Calculator

$$\gamma_{sat} = \frac{\gamma' \cdot \varphi'}{\varphi_{IF} \cdot f_s}$$

$$10.05487\text{N/m}^3 = \frac{31\text{N/m}^3 \cdot 9.99^\circ}{11^\circ \cdot 2.8}$$

9) Saturated Unit Weight given Weighted and Mobilized Friction Angle

Open Calculator

fx $$\gamma_{sat} = \frac{\gamma' \cdot \varphi_m}{\varphi_w}$$

ex $$9.538462\text{N/m}^3 = \frac{31\text{N/m}^3 \cdot 40^\circ}{130^\circ}$$

10) Saturated Unit Weight given Weighted Friction Angle

Open Calculator

fx $$\gamma_{sat} = \frac{\gamma' \cdot \varphi_{iw}}{\varphi_w}$$

ex $$9.979615\text{N/m}^3 = \frac{31\text{N/m}^3 \cdot 41.85^\circ}{130^\circ}$$

11) Submerged Unit Weight given Factor of Safety with respect to Shear Strength

Open Calculator

fx $$\gamma' = \frac{\tan\left(\frac{\varphi_w \cdot \pi}{180}\right)}{\left(\frac{1}{\gamma_{sat}}\right) \cdot \left(\frac{\tan\left(\frac{\Phi_i \cdot \pi}{180}\right)}{f_s}\right)}$$

ex $$43.84998\text{N/m}^3 = \frac{\tan\left(\frac{130^\circ \cdot \pi}{180}\right)}{\left(\frac{1}{9.98\text{N/m}^3}\right) \cdot \left(\frac{\tan\left(\frac{82.87^\circ \cdot \pi}{180}\right)}{2.8}\right)}$$

12) Submerged Unit Weight given Weighted and Effective Friction Angle

Open Calculator

$$\gamma' = \frac{\varphi_{IF} \cdot \left(\frac{180}{\pi}\right)}{\frac{\varphi' \cdot \left(\frac{180}{\pi}\right)}{f_s \cdot \gamma_{sat}}}$$

$$30.76917\text{N/m}^3 = \frac{11^\circ \cdot \left(\frac{180}{\pi}\right)}{\frac{9.99^\circ \cdot \left(\frac{180}{\pi}\right)}{2.8 \cdot 9.98\text{N/m}^3}}$$

13) Submerged Unit Weight given Weighted and Mobilised Friction Angle

Open Calculator

$$\gamma' = \frac{\gamma_{sat} \cdot \varphi_w}{\varphi_m}$$

$$32.435\text{N/m}^3 = \frac{9.98\text{N/m}^3 \cdot 130^\circ}{40^\circ}$$

14) Submerged Unit Weight given Weighted Friction Angle

Open Calculator

$$\gamma' = \frac{\varphi_w \cdot \gamma_{sat}}{\varphi_{iw}}$$

$$31.00119\text{N/m}^3 = \frac{130^\circ \cdot 9.98\text{N/m}^3}{41.85^\circ}$$

15) Weighted Friction Angle given Effective Angle of Internal Friction

Open Calculator

$$\varphi_{IF} = \frac{\gamma' \cdot \varphi'}{f_s \cdot \gamma_{sat}}$$

$$11.08252^\circ = \frac{31\text{N/m}^3 \cdot 9.99^\circ}{2.8 \cdot 9.98\text{N/m}^3}$$

16) Weighted Friction Angle given Factor of Safety with respect to Shear Strength

Open Calculator

$$\varphi_w = a\tan\left(\left(\frac{\gamma'}{\gamma_{sat}}\right) \cdot \left(\frac{\tan((\Phi_i))}{f_s}\right)\right)$$

$$83.56667^\circ = a\tan\left(\left(\frac{31\text{N/m}^3}{9.98\text{N/m}^3}\right) \cdot \left(\frac{\tan((82.87^\circ))}{2.8}\right)\right)$$

17) Weighted Friction Angle given Mobilised Friction Angle

Open Calculator

$$\varphi_w = \frac{\gamma' \cdot \varphi_m}{\gamma_{sat}}$$

$$124.2485^\circ = \frac{31\text{N/m}^3 \cdot 40^\circ}{9.98\text{N/m}^3}$$

18) Weighted Friction Angle given Submerged Unit Weight

Open Calculator

fx $$\varphi_w = \frac{\gamma' \cdot \varphi_{iw}}{\gamma_{sat}}$$

ex $$129.995^\circ = \frac{31\text{N/m}^3 \cdot 41.85^\circ}{9.98\text{N/m}^3}$$

Variables Used

- f_s Factor of Safety
- γ_{sat} Saturated Unit Weight *(Newton per Cubic Meter)*
- γ' Submerged Unit Weight *(Newton per Cubic Meter)*
- φ Angle of Internal Friction *(Degree)*
- φ' Effective Angle of Internal Friction *(Degree)*
- Φ_i Angle of Internal Friction of Soil *(Degree)*
- φ_{IF} Weighted Friction Angle for Internal Friction *(Degree)*
- φ_{iw} Internal Friction Angle with Weighted Frict. Angle *(Degree)*
- φ_m Angle of Mobilized Friction *(Degree)*
- φ_w Weighted Friction Angle *(Degree)*

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: **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: **Angle** in Degree (°)
  Angle Unit Conversion
- Measurement: **Specific Weight** in Newton per Cubic Meter (N/m³)
  Specific Weight Unit Conversion

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- 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
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