

Soil Shear Strength

Civil Engineering

Mohr-Coulomb, total against effective.

Soil shears when the stress on a plane reaches the cohesion and friction available on it.

$$\tau = c + \sigma \tan \varphi \cdot \text{Effective: } \tau = c' + \sigma' \tan \varphi'$$

Clean dense sand

Friction only.

$$c' \approx 0, \varphi' \text{ near } 35^\circ$$

Clay, fast loading

Undrained, $\varphi_u = 0$.

$$\tau = c_u$$

Clay, long term

Drained parameters.

Use c' and φ'

THE COMMON MISTAKE

✗ **Mixing total and effective parameters**

✓ **Keep the two sets apart**

Total-stress parameters belong with undrained loading, effective ones with drained. Mixing the sets returns a strength the soil does not have.

Educational reference. Mohr-Coulomb is a model. Strength parameters come from testing and a qualified engineer.