

The University of Iowa
Department of Civil & Environmental Engineering
SOIL MECHANICS 53:030
Supplemental Problem for Homework # 11

Problem:

A silty soil has drained Mohr-Coulomb strength parameters $c=50\text{kPa}$ and $\phi_D = 30^\circ$. A sample of this soil has been reconsolidated under the same stresses it experienced in the field: $\sigma_v = 200\text{kPa}$; $\sigma_h = 160\text{kPa}$. The pore pressure in the sample after it is fully consolidated under these stresses is 100 kPa . A drained strength test in the triaxial cell is then performed to shear failure: During the test, pore pressure is kept constant while σ_v is increased and σ_h is decreased simultaneously by half the amount (*i.e.* $\Delta\sigma_h = -1$ when $\Delta\sigma_v = +2$).

- i. Using Mohr's circle, find an expression relating the principal effective stresses σ'_1 and σ'_3 at failure.
- ii. What are the total principal stresses σ_1 and σ_3 at failure?
- iii. What is the orientation of the plane on which shear failure occurs, and what are the effective stresses on that plane?