



Geotechnical Engineering–II

BSc Civil Engineering – 5th Semester

Lab # 4

by

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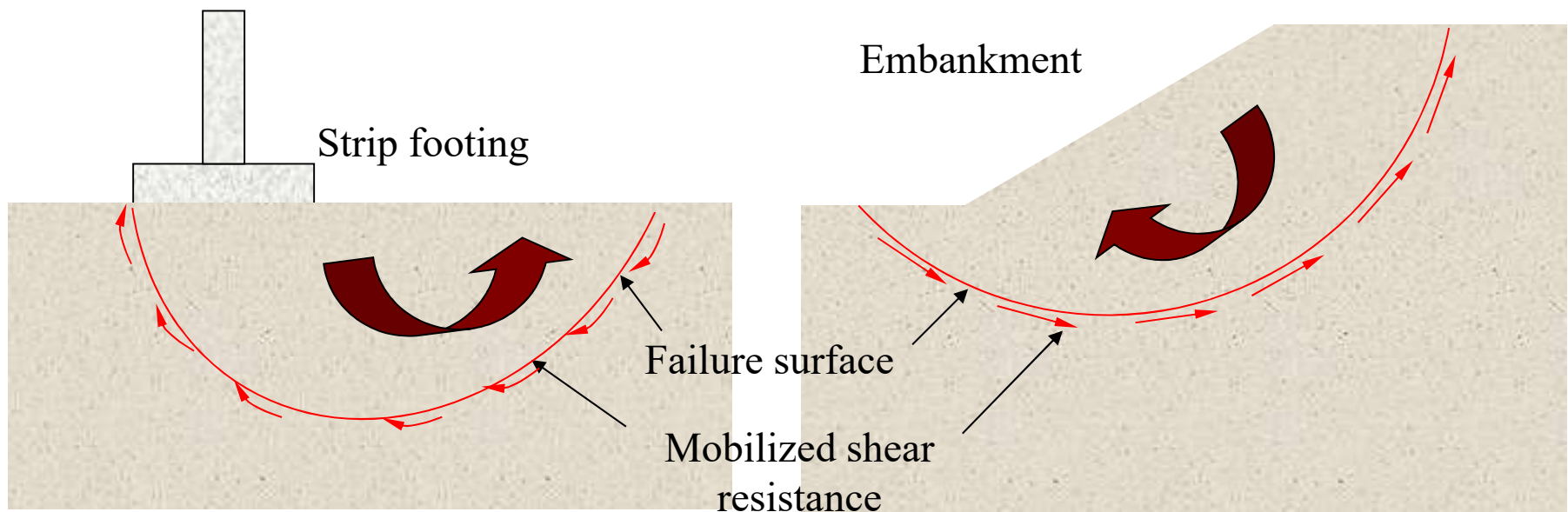
Lecture Handouts: <https://groups.google.com/forum/#!/forum/geotech-ii>

SOIL STRENGTH

SOIL

- Mostly loaded in *compression*
- But fails mostly in *shear*

- *Mohr-Coulomb Failure Theory* → $\tau_f = c + \sigma \tan \phi$



SHEAR STRENGTH

- LAB DETERMINATION -

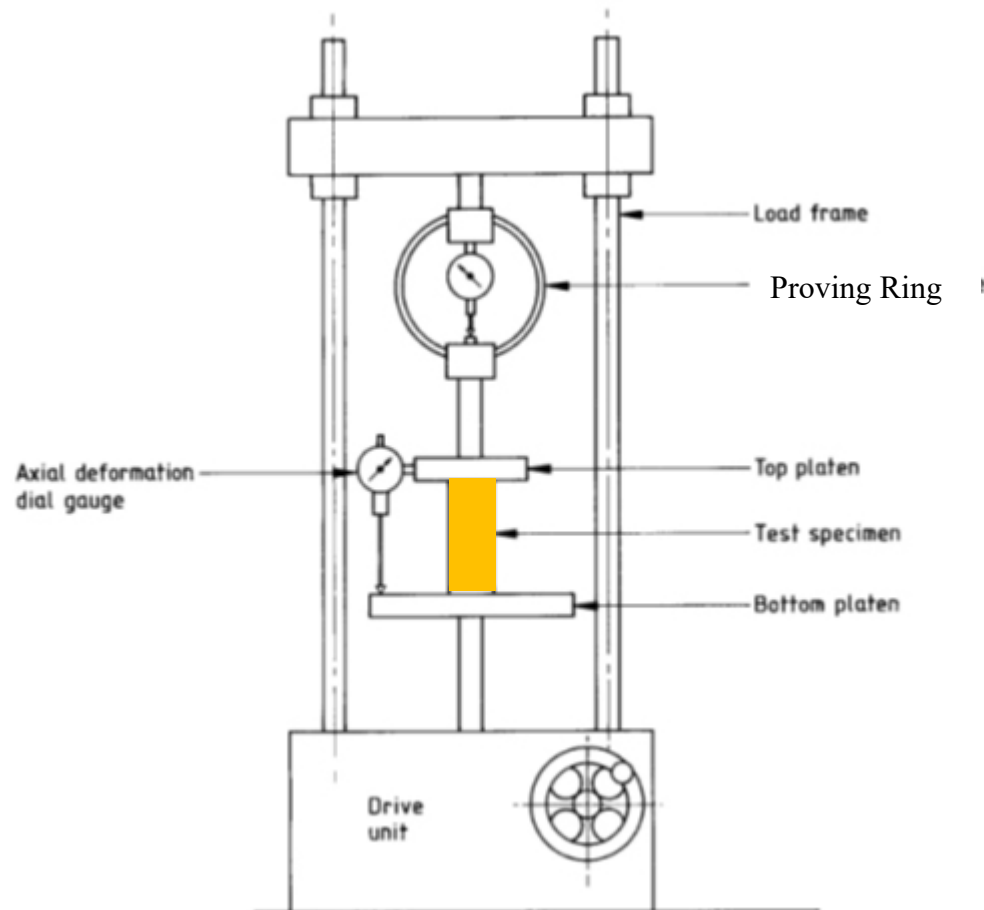
1. Direct shear test
2. Unconfined compression test
3. Triaxial compression test

Unconfined Compression Test

- “*Unconfined*” sample
- For cohesive soils only

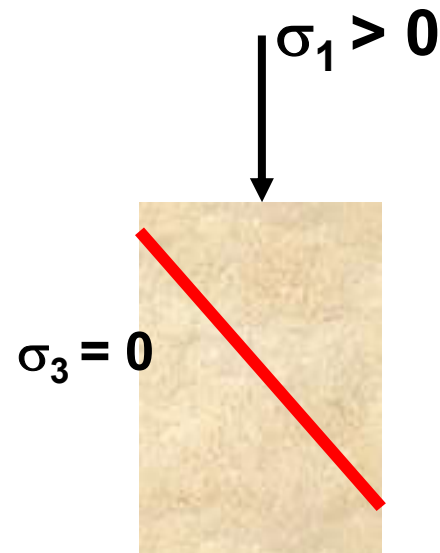
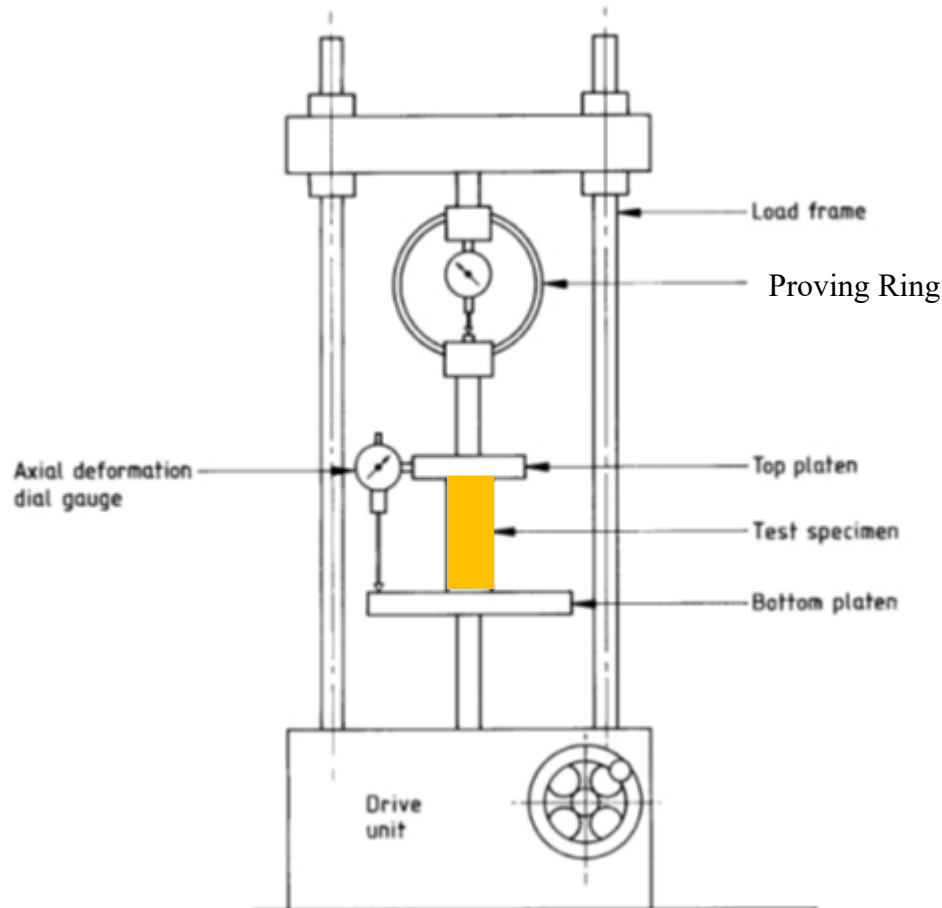
UNCONFINED COMPRESSION TEST

$$\tau_f = c + \sigma \tan \phi$$



UNCONFINED COMPRESSION TEST

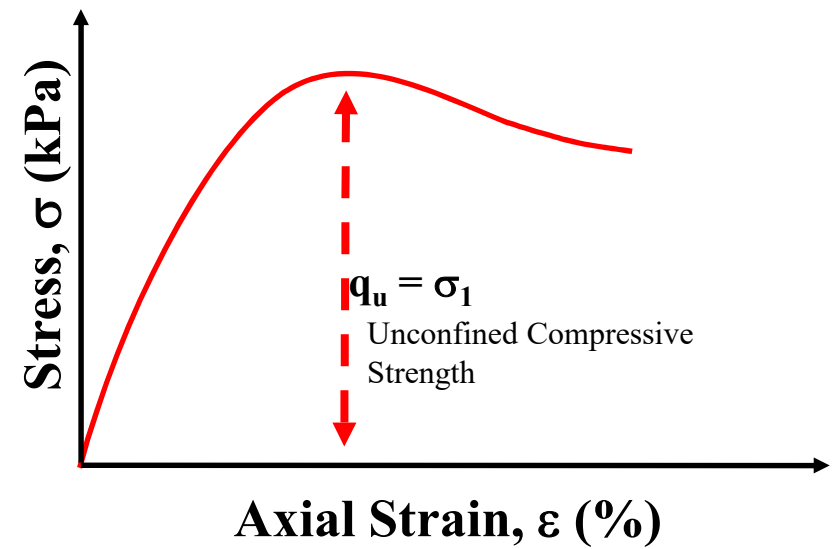
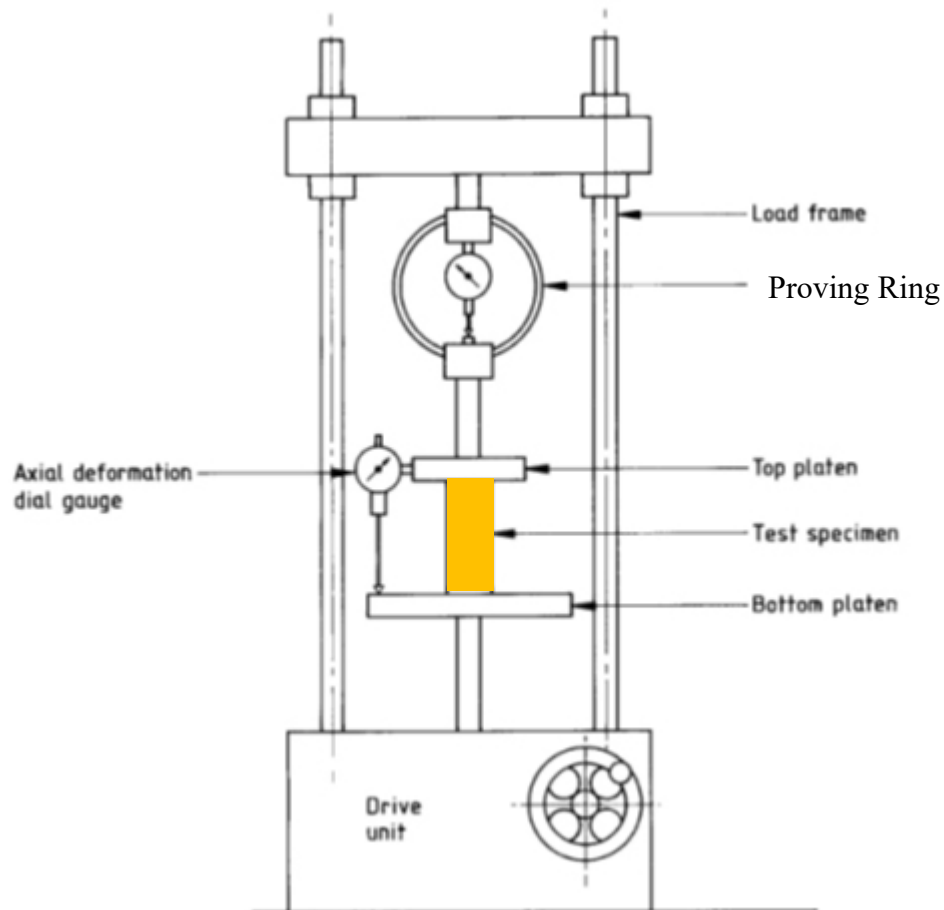
$$\tau_f = c + \sigma \tan \phi$$



Confining pressure, $\sigma_3 = 0$

UNCONFINED COMPRESSION TEST

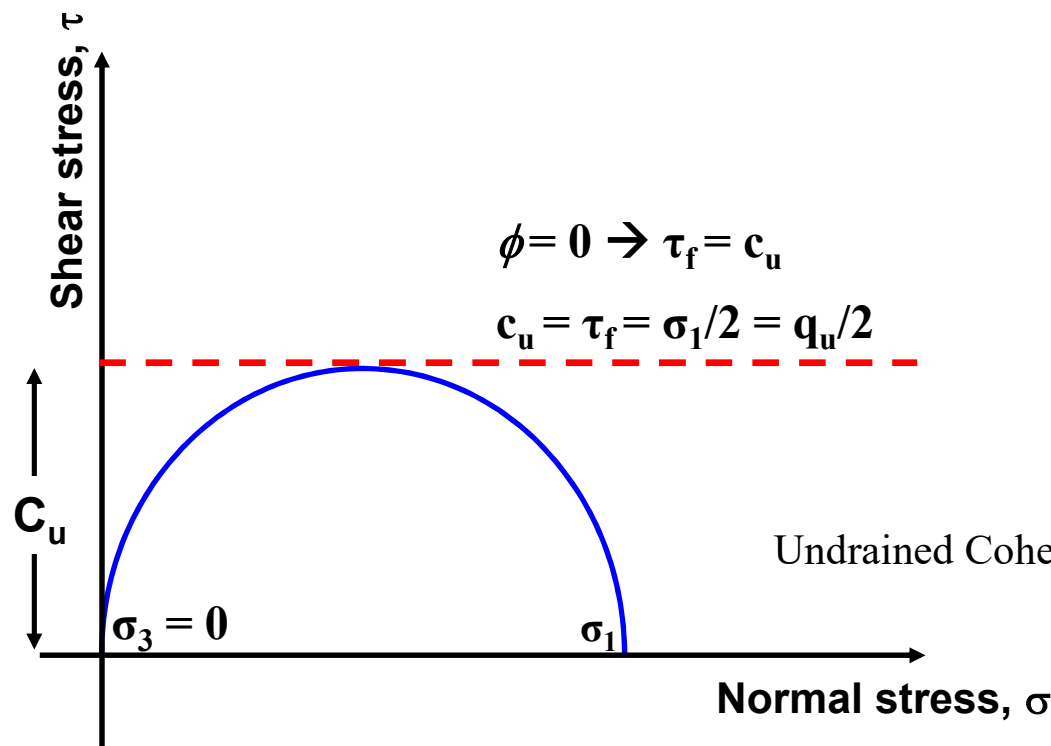
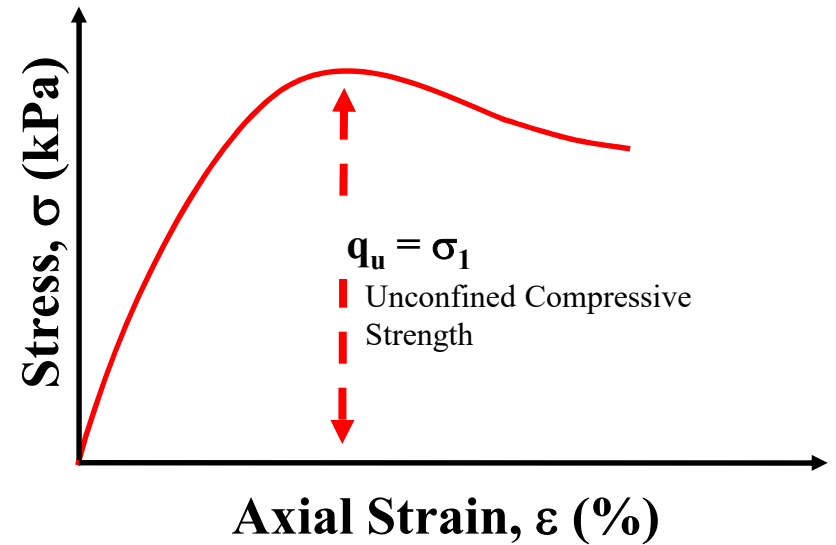
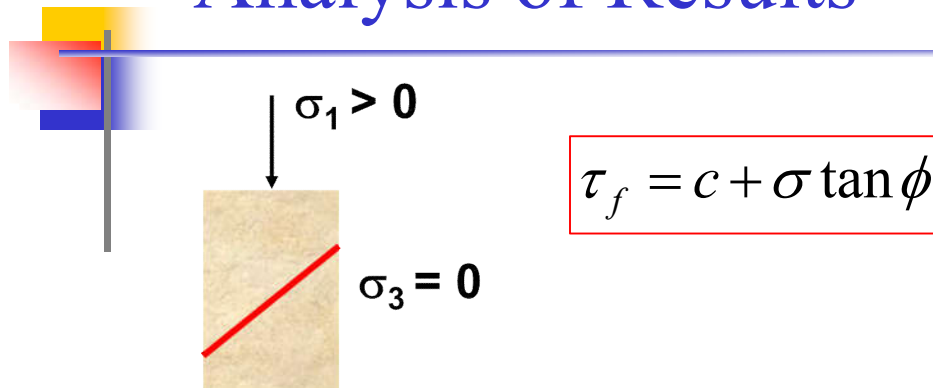
$$\tau_f = c + \sigma \tan \phi$$



UNCONFINED COMPRESSION TEST

- Analysis of Results -

How to determine shear strength parameters c and ϕ ?



UNCONFINED COMPRESSION TEST

- Calculations -

Sample Calculations

Dia. Of Sample, D	=	1.5 in		
Length of Sample, Lo	=	3 in		
Original x-area of Sample, Ao	=	1.767 in ²		
Volume of the Sample, V	=	5.30 in ³		
Wt. of the Specimen, M	=	0.1 lb		
Bulk Density, γ_b	=	0.019 lb/in ³		
Moisture Content, w	=	%		
Proving Ring Constant	=	0.8 lb/div		
DDG L.C.	=	0.0005 in		

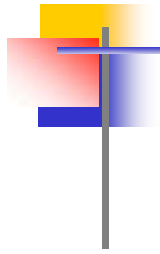
Sample #	Cell Pressure	DDG Reading	Proving Ring DG Reading	Sample Deformation	Axial Strain	Corrected Area	Axial Load	Axial Stress	
	(kPa)	(div.)	(div.)	$\Delta L = \text{Col-3} \times \text{LC}$	$\xi = \Delta L / L_o$	$A_c = A_o / (1 - \xi)$	Col-4 x PRC	Col-8 / Col-7	
	(kPa)	(div.)	(div.)	(in)		(in ²)	(lb)	(psi)	(kPa)
Col-1	Col-2	Col-3	Col-4	Col-5	Col-6	Col-7	Col-8	Col-9	
1	0	0	0	0.000	0.0000	1.767	0.00	0.00	0.00
		10	4	0.005	0.0017	1.770	3.20	1.81	12.46
		20	6	0.010	0.0033	1.773	4.80	2.71	18.67
		30	7	0.015	0.0050	1.776	5.60	3.15	21.74
		40	9	0.020	0.0067	1.779	7.20	4.05	27.91

UNCONFINED COMPRESSION TEST

- Specimen Preparation -

1. Undisturbed Sample
2. Remolded Sample

Hands-on Learning



CONCLUDED