

NOTES ON SHEAR STRENGTH OF SOILS

(FOR A 100% SATURATED IDEAL SOIL)

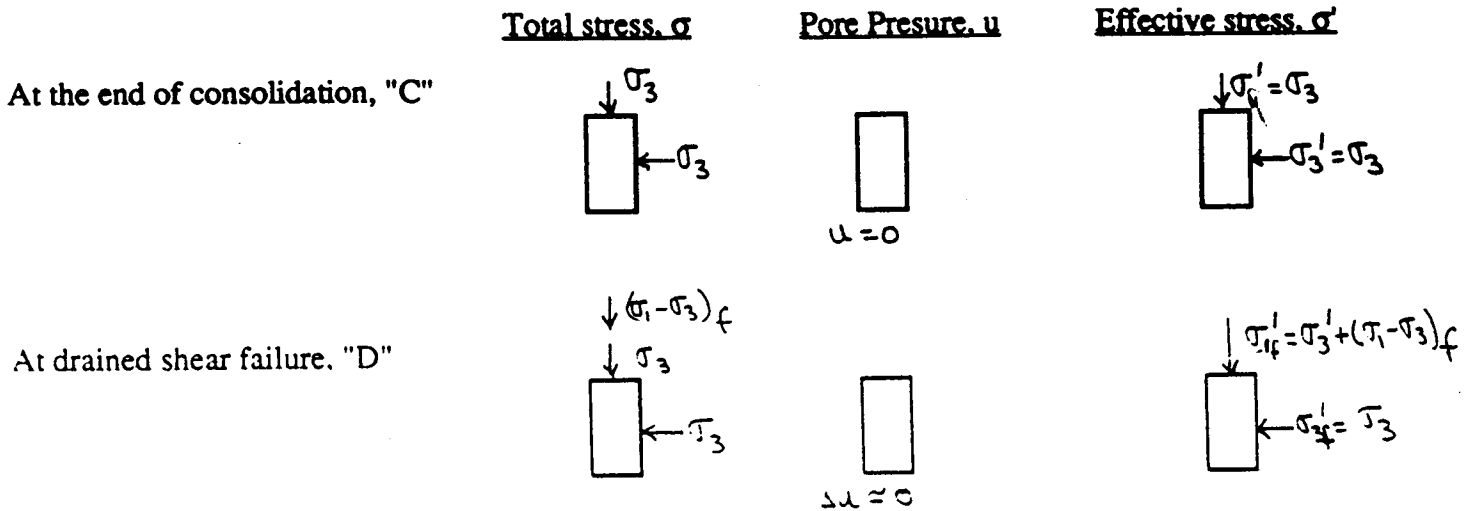
STRENGTH TESTS METHODS:

	<i>DIRECT SHEAR TEST</i>	<i>TRIAxIAL COMPRESSION TEST</i>
Stress controlled:	Vertical normal stress, σ_n	Isotropic confining normal stress, σ_3
Response measured:	Shear stress at failure, τ_f	Stress deviator at failure, $(\sigma_1 - \sigma_3)_f$
Strength parameters:	c, ϕ	c, ϕ
Operating strength relationship:	$\tau_f = c + \sigma_n \tan \phi$	$\sigma_{1f} = \sigma_{3f} \tan^2 (45^\circ + \frac{\phi}{2}) + 2c \tan (45^\circ + \frac{\phi}{2})$

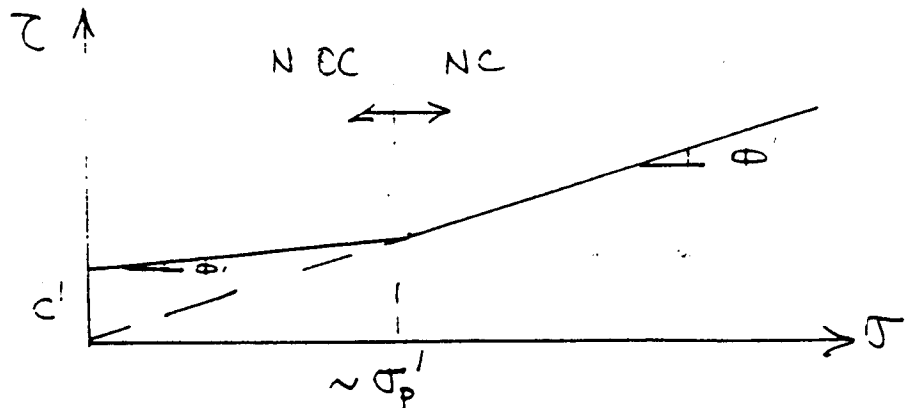
STRENGTH TEST TYPES BASED ON DRAINAGE CONDITIONS DURING TEST:

Drainage control during application of the controlling stress (σ_n or σ_3) is referred to as "consolidated" (C) or "unconsolidated", (U). Drainage control during shear stress application (τ or $\sigma_1 - \sigma_3$) is referred to as "drained," (D) or "undrained", (U). The three types of such tests are described for triaxial compression test. The same concepts are also applicable in direct shear test.

Consolidated Drained Test (CD)

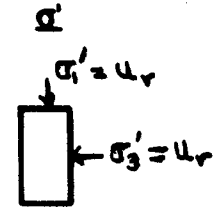
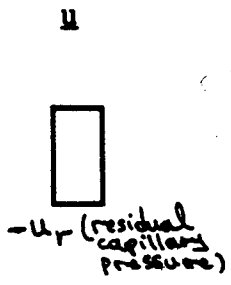
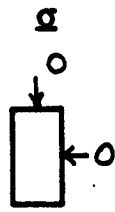


$$\sigma_{1f} = \sigma_{3f} \tan^2(45^\circ + \phi/2) + 2c' \tan(45^\circ + \phi/2)$$

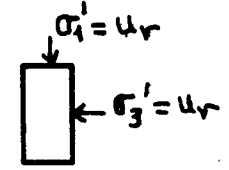
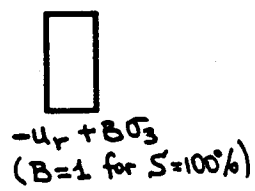
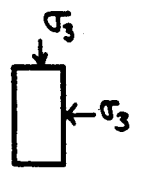


Unconsolidated Undrained Test (UU)

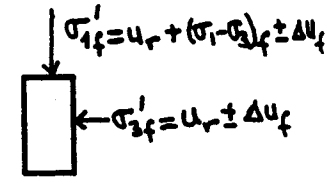
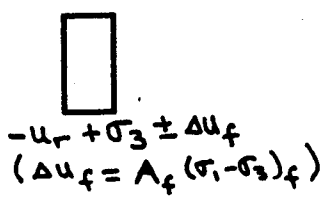
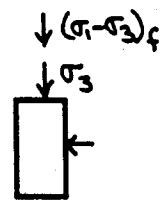
After sampling



After application of cell pressure (unconsolidated), "U"



At undrained shear failure, "U"



Note: For the unconfined compression test, $\sigma_3 = 0$

$\sigma_{1f} = \sigma_{3f} + 2c_u$

