(3) SHANSEP (Charles C. Ladd (MIT))

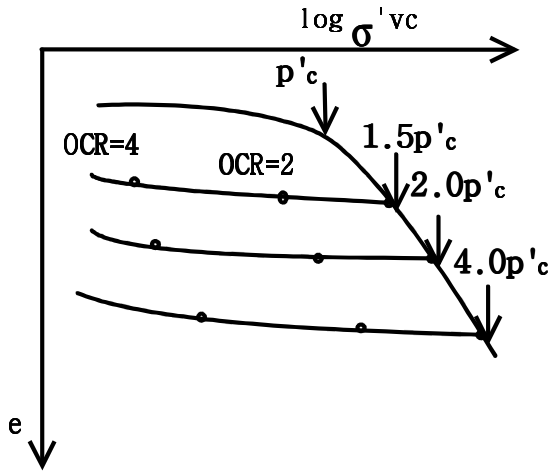
Stress History And Normalized Soil Engineering Properties.

⇒ Undrained shearing behaviors of clays can be represented by normalized strength concept. (s_u / σ'_{vc} = f(soil type & OCR…)

① Sample disturbance + consolidation stress state + stress history

NC soils → consolidate samples to 1.5 , 2.0 and 4.0 times larger than p'_c (maximum past pressure) with $\underline{K_0 \text{ state}}$.

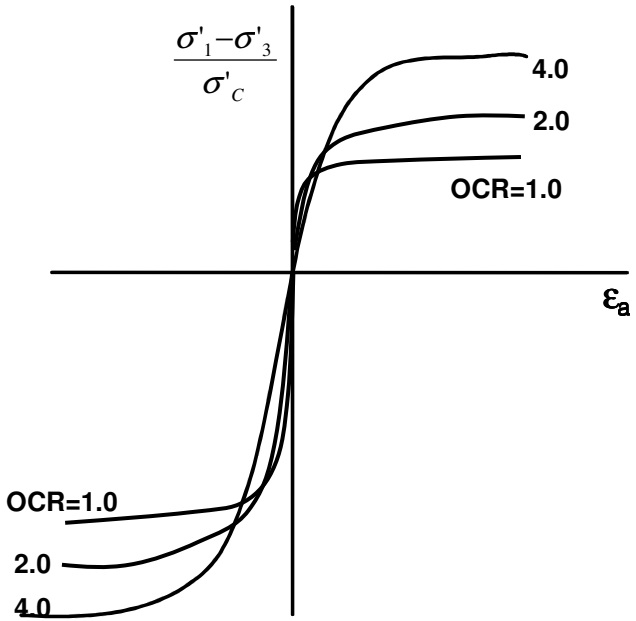
OC soils → follow the same procedure as NC soils and then unload to a given value of OCR.



② Strain rate + anisotropy

⇒ shear samples with 0.5%/hr strain rate for CK_0U TXC and RTXE, DSS conditions.

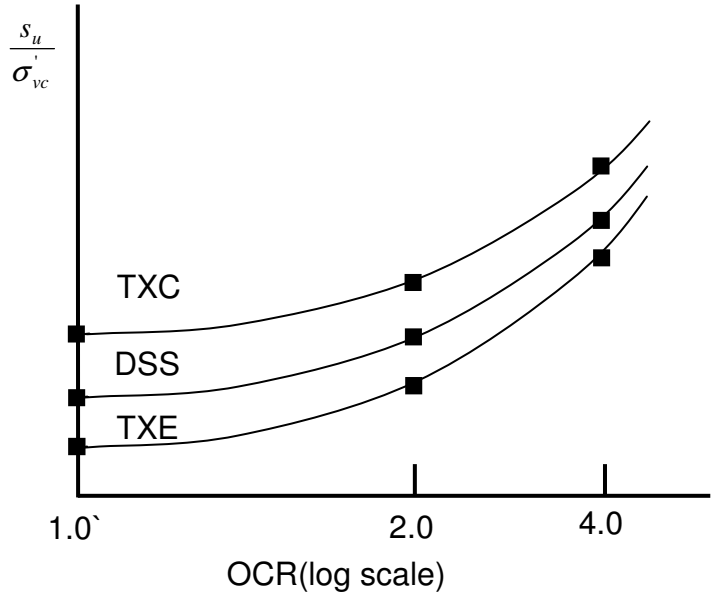
③ We get normalized results from step ②.



\+ Normalized Pore

Pressure Response.

④ Combine the results.



Problems with SHANSEP.

1. Determination of p'_c (max. past pressure).

   → Sample disturbance obscures to obtain p'_c and lowers it.

   → Secondary compression can have a large influence on measured value of p'_c for highly compressible clays.

   → Knowledge of geologic history is very important.

2. Determination and duplication of stress systems (stress ratio of consolidation (σ'_h / σ'_v) → K_0 value.)

   → Difficult to measure it and apply it for lab testing.

3. Difficult to get s_u for heavily overconsolidated clays. (*with high p'$_c$*)

   → Practically difficult to reach 1.5 to 4.0 p'$_c$ because of high p'$_c$ and OCR.

   → Use recompression techniques.

4. Not acceptable for sensitive or structured clays.

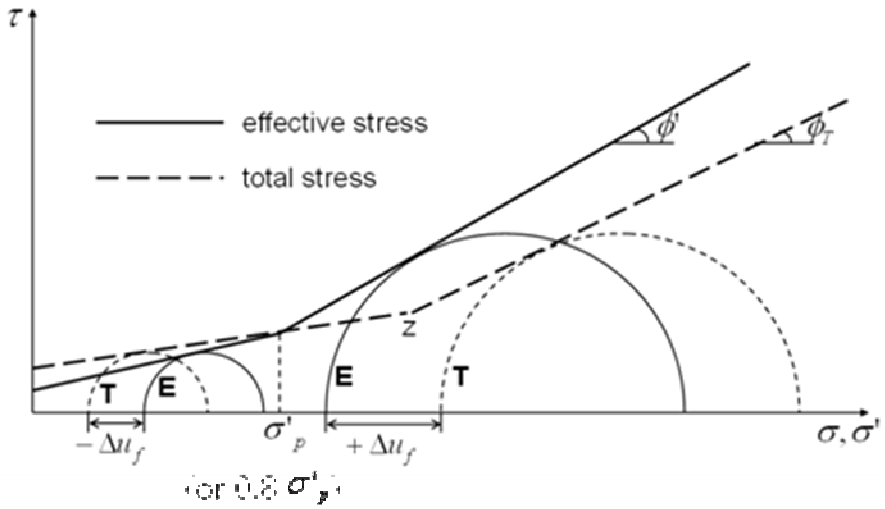
← SHANSEP employs mechanical stress history approach.

5. In situ soil has some variations of water content even if we assume it is homogeneous. → For more precise estimation of strength, we have to consider water content variation.

6. A lot of works are required.

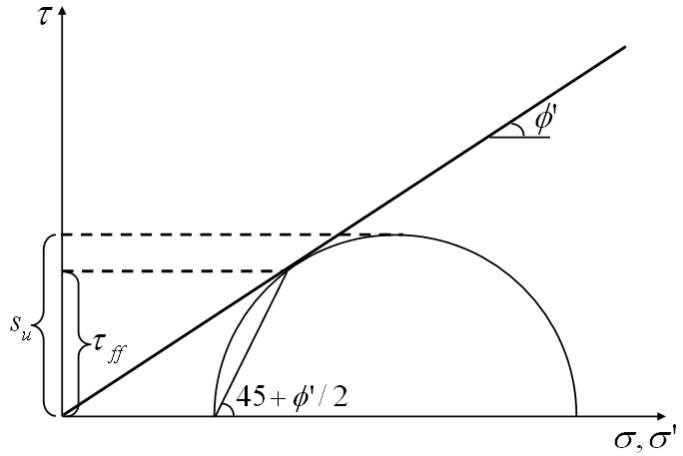
Notes.

1. Mohr-Coulomb failure envelopes over a range of stress spanning the preconsolidation stress, σ'_p.



Typical point $z \approx 2\sigma'_p$ (Hirschfeld, 1963)

2. s_u vs. τ_{ff} (shear stress on failure plane at failure.)



$$\therefore \tau_{ff}\,(=s_u\cos\phi') < \tau_{max}\,(=s_u)$$