SETTLEMENT ANALYSES FOR COHESIVE SOILS

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2.4 SAMPLE DISTURBANCE AND LABORATORY VERSUS IN SITU COMPRESSION CURVES

Figure 2-6 illustrates the effects of sample disturbance by showing compression curves from oedometer tests on "good" and "bad" samples of an overconsolidated clay. Disturbance:

(1) Decreases the void ratio (or increases the strain) at any given value of consolidation stress;

(2) Makes it difficult to define the point of minimum radius, thus obscuring $\bar{\sigma}_{vm}$;

(3) Lowers the estimated value of $\bar{\sigma}_{vm}$ from the Casagrande construction if the disturbance gets excessive,* especially with sensitive clays and clays that have a quasi-preconsolidation pressure;

(4) Increases the compressibility in the recompression region. Terzaghi and Peck (1967), p. 76, state that if the in situ stress increase is small compared to $\bar{\sigma}_{vm}$, the compressibility of even good samples may be 2 to 5 times larger than the in situ compressibility; OCR !

(5) Decreases the compressibility in the virgin compression region.

SOIL MECHANICS IN ENGINEERING PRACTICE

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If the consolidation test is made on an undisturbed sample carefully carved out of the ground in a shaft, the curve K_u is obtained. By adding the distance *cb* to the ordinates of this curve we obtain the curve K_u' which passes through *b*. Although the slope of K_u' is much smaller than that of K_r', it has been found that, if Δp is smaller than about one half of $p_0' - p_0$, the compression of the clay computed on the basis of K_u' is still two to five times greater than the actual compression of the clay in the field. Hence, extrapolation from test results to field conditions is very uncertain, irrespective of the care with which sampling operations are carried out.

Computation of the relation between *e* and *p* for a clay with a given liquid limit on the basis of equation 13.11 leads to a curve through *b* which is steeper than K_r'. The ordinates of this curve with reference to a horizontal line through *b* are equal to at least twice the ordinates of K_u', which in turn are two to five times greater than those of the field *e–p* curve K'. Hence, the use of equation 13.11 for estimating the compressibility of a precompressed clay leads to values between four and ten or more times greater than the correct ones. Since the same equation furnishes reasonably accurate values when applied to normally loaded clays, it is obvious that the load history of a clay is of outstanding practical importance.