PARAMETER DETERMINATION

An often reported obstacle that causes users to forgo use of the Soft Soil Creep model is the determination of the stiffness parameters $\lambda^*, \kappa^*, \mu^*$ and the initial OCR, especially since the creep behaviour depends on all four parameters.

In principal all four parameters can be derived from a standard oedometer test, provided that the test has been performed for long enough after applying the load step. Preferably, the test results are plotted as the volumetric strain, $\varepsilon_v$, versus the natural logarithm of the mean effective stress, $\ln(p')$. The volumetric strain of an oedometer test sample can easily be calculated by dividing the settlement by the original sample height.

As usual, the graph of $\ln(p')$ vs. $\varepsilon_v$ (Figure 1) will provide the $\kappa^*$ and $\lambda^*$ from the inclination of the settlement curve before and after the preconsolidation stress $P_c$. And the OCR can be calculated from this preconsolidation stress, if the mean stress level at the depth where the sample was been taken from, is known.

Further take into account that these parameters cannot be varied unlimitedly. The ratio of the unloading/primary loading stiffness, $\lambda^*/\kappa^*$, cannot be smaller than 1 and should normally be between 2 and 10. Users should be very wary of values outside this range; for most practical cases the value of the $\lambda^*/\kappa^*$ ratio falls within the range of 3 to 7.

Secondly there is the creep ratio, $(\lambda^* - \kappa^*)/\mu^*$, to consider. This ratio can have a wide range of values, normally between 5 and 25, where high values represent stiff soils with little creep and small values represent soft soils with a considerable amount of creep. For most practical cases the ratio falls within the range of 10 to 20, and if the creep ratio is over 25 one could reconsider the use of the creep model. For these relatively stiff soils creep is of minor importance and the Soft Soil model or even Hardening Soil model could be used instead.

CLOSING REMARKS

The Soft Soil model and the Soft Soil Creep model have a different default setting for the slope of the Critical State Line, the M-parameter. For the Soft Soil model the default value of the M-parameter is chosen such that the simulation of an oedometer test will give the most realistic results. The Soft Soil Creep model on the other hand chooses the M-parameter such that the simulation of an undrained triaxial test gives the best results. When calculations using the Soft Soil and the Soft Soil Creep model are compared, one has to manually alter the default value of the M-parameter in order to obtain similar results. This can be done by changing $K_{yc}$ in the Advanced material properties window.

Although the parameter determination for the SSC model will sometimes be hindered by a practical lack of long-term oedometer measurements, it is often worthwhile to determine these parameters if possible. Although there remains a gap between accurately-modelling a oedometer test and making a prediction for a practical case the SSC model offers enough possibilities for the accurate prediction of long-term settlements of embankments on soft marine clays and peats.