International Society for Soil Mechanics and Geotechnical Engineering

Technical Committee TC306 Geo-engineering Education

Short educational video

"Porto Tolle test embankment - A full scale experiment on the consolidation of a thick clay layer"

Delivered by

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Notes for instructors

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Recommendation for usage

Ask the students to watch the webinar on their own (telling them to expect some difficulties with English) and then use some of the slides to stress selected points.

Field observations that agree with theory & with what we teach

SLIDE 8

The undrained strength of a normally consolidated clay increases linearly with depth. The preconsolidation pressure is in good agreement with the in situ effective stress.

SLIDE 29 – observation A

For central locations in the embankment, the excess pore pressure is very close to the uniform load imposed by the embankment (γh) and 3D effects are not very important. The same is approximately true for the other locations at medium depths (see 12-15 intermediate). At greater depths, the 1D approximation deviates more from the 3D (triaxial), but there we also need to consider that the clay is not 100% saturated [see Slide 29 – observation B]

SLIDE 22

Sand layers settle fast after loading, clay layers settle in a slower manner. The 13-30m clay layer settles less mainly because it is stronger, and less due to load dissipation at depth.

Field observations that need some further analysis to show that they agree with theory

SLIDE 23

Pore pressure measurement points 2 and 4 are symmetrical (with respect to the draining clay boundaries), so they should have similar responses. This is not the case because point 4 is in the unsaturated lower part of the clay layer: we see that it develops a smaller excess pore pressure, which dissipates slower. This is confirmed in Slide 25 and 29B.

SLIDE 29 – observation B

The undrained pore pressure generation in the unsaturated part of the clay layer needs to take into account that $B < 1$.

Field "surprises"

SLIDE 20

Measured settlement values: min = 80cm, max 100cm → 20% - 25% difference (this may be expected in the field, but we typically do not prepare students for such a variation)

SLIDES 15, 34 & 35

Field values of Cv are expected to be larger than those measured in the field (this is something we should stress more with students, especially for this particular parameter)