COLLABORATIVE RESEARCH CENTER 837

INTERACTION MODELING IN MECHANIZED TUNNELING

RUB

DETERMINATION OF IN-SITU HORIZONTAL STRESS IN SAND VIA CPT

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Cone Penetration Test (CPT) is widely used as a common in-situ test for site characterization. The measurements of cone tip resistance, sleeve friction, and pore water pressure during penetration are used to obtain soil stratigraphy and parameters needed for geotechnical engineering design. However, research in this practical field of geotechnical engineering has repeatedly shown that, in sandy soils, CPT measurements depend on both sand relative density and in-situ horizontal stress. Therefore, empirical relationships developed to correlate CPT measurements with soil parameters have the shortcoming of not being able to distinguish the separate effects of these two important factors on cone tip resistance.

In this presentation, after a brief introduction on CPT test, the results of a numerical procedure to model CPT penetration are discussed. The predictions of cone tip resistance obtained in this numerical approach are then verified with reliable CPT measurements performed

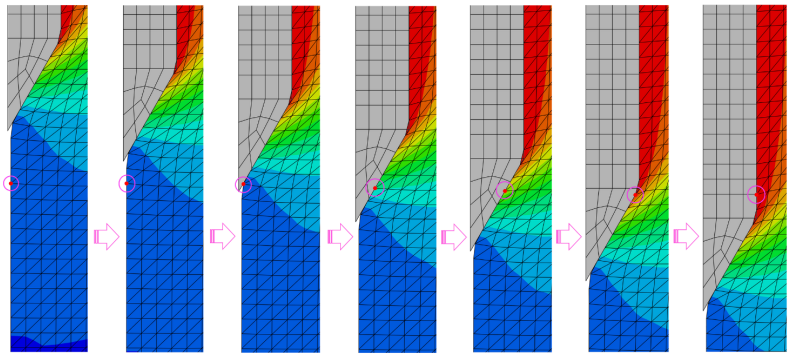

Fig. 1: Node tracking during numerical penetration process

in calibration chambers having controlled sand relative density and stress state. The numerical modeling approach also provides other very important additional information (such as soil particle velocity around the cone during penetration, radius of plastic zone) which cannot be easily measured during normal penetration tests. These additional information obtained in the numerical procedure are then used to tackle an analytical solution on CPT penetration providing two relationships for cone tip resistance and friction sleeve from which sand relative density and in-situ horizontal stress can be evaluated independently. Based on these relationships, practical engineering charts are presented through which geotechnical engineers can evaluate sand relative density and in-situ horizontal stress from CPT measurements.

Guests are welcome!

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