



Australian Geomechanics Society

Sydney Chapter

“Vacuum Consolidation of Soft Clay via Vertical Drains”

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Auditorium, Ground Floor, 8 Thomas Street, Chatswood

(see map below for venue location)

Light refreshments at 5.30 pm for 6 pm meeting

SYNOPSIS

In many countries, the majority of population lives along the coast, which contains soft soil deposits that require ground improvement. Loose sandy soils and soft compressible clays are very common along the coastal regions. The use of vertical drains with vacuum preloading is considered as the most effective and economical method for improving soft clays (normally consolidated to lightly over-consolidated) to eliminate settlements of the permanent infrastructure. Application of vacuum pressure via prefabricated vertical drains promotes radial flow consolidation enhancing the shear strength of the compressed ground. In this presentation, the mechanisms of the vacuum preloading system based on current practices are described through the selection of important design parameters. An advanced analytical solution based on actual radial soil permeability is proposed considering the variation of vacuum pressure. The Cavity Expansion Theory is employed to predict the smear zone caused by the installation of mandrel driven vertical drains. The predicted smear zone and the effect of drain unsaturation are compared with data obtained from a large-scale radial consolidation tests and the results are explained.

The 3D and 2D numerical analyses incorporating equivalent plane strain solutions were performed to predict the soil responses based on selected case histories. It is found that the accuracy of modelling depends on the correct selection of the constitutive model applied in the numerical analysis. Apart from realistic 3D numerical modeling, the equivalent plane strain solution can now be used as a predictive tool with an acceptable accuracy as a result of the significant process that has been made in the past decades through rigorous mathematical modelling and numerical analyses. Finally, a parametric study of the combination of vacuum and surcharge preloading is conducted to demonstrate how any excessive lateral displacements can be avoided.

ABOUT THE SPEAKER

Buddhima is Professor of Civil Engineering at the University of Wollongong. His research interests include Ground Improvement including Sub-surface Drainage and Soft Clay Stabilisation; Large Scale Geotechnical Testing and Process Simulation, Railway Foundations, Jointed Rock Engineering, Geoenvironmental Engineering, Dams and Embankment Engineering, Numerical & Analytical Modelling; and Ground Instrumentation.

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*Attendance may be credited (1 point)
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LOCATION PLAN FOR 8 THOMAS STREET, CHATSWOOD

