

SEISMIC BEHAVIOUR OF PILE FOUNDATIONS

Speaker

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Abstract

Pile foundations are the most common type of deep foundations used worldwide. The seismic behaviour of pile foundations is of much interest across the seismic regions of the world, as many failures of pile foundations were recorded in the previous earthquakes. This is especially the case where the pile foundations pass through loose, saturated sands that are vulnerable to seismic liquefaction. Similarly the pile foundations that pass through clay layers are also vulnerable to seismic shaking due the kinematic and inertial interaction between the piles and the surrounding soil.

In this lecture the pile foundations that have suffered failure in previous earthquakes will be presented. This will be followed by recent research at Cambridge on the pile-soil interaction in soft clays particularly with respect to inertial and kinematic interactions. Of course, dynamic centrifuge modelling was pivotal in creating the understanding of these interactions that were measured directly by instrumenting the model piles. The bending moments from the kinematic interactions are directly compared to existing empirical and semi-empirical procedures. We will then move onto the pile behaviour in liquefied soils. It will be shown how dynamic centrifuge modelling played a key role in identifying pile buckling in liquefied soils in single pile and pile groups. The axial load redistribution during soil liquefaction will be discussed. Finally the lateral spreading of soil and its effect on pile behaviour will be presented.

Biography

Prof Gopal Madabhushi, FEng, FICE, is a Professor of Civil Engineering at the University of Cambridge, UK and the Director of the Schofield Centre. He is a Professorial Fellow of Girton College, Cambridge. He is the Head of Geotechnical and Geo-Environmental Group of the Department of Engineering at Cambridge. He has over 35 years of experience in the area of Soil Dynamics and Earthquake Engineering. His expertise extends from dynamic centrifuge modelling to the time domain finite element analyses of earthquake engineering problems. He has an active interest in the areas of soil liquefaction, soil-structure interaction and liquefaction resistant measures and their performances. He has an active interest in the biomechanics of hip replacement surgeries. He has acted as an expert consultant to the industry on many geotechnical and earthquake engineering problems e.g. Mott MacDonald, Royal Haskonig and Ramboll-Whitby, Offshore Wind Logistics Ltd (OWLC), UK, Adani Green Energy Limited, India etc. He has an active interest in post-earthquake reconnaissance work and has led engineering teams from UK to 921 Ji-Ji earthquake of 1999 in Taiwan, the Bhuj earthquake of 2001 in India and many other missions. He served as the Chairman of Earthquake Engineering Field Investigation Team (EEFIT) that runs under the auspicious of Institute of Structural Engineers, London. He was awarded the TK Hsieh award in 2005, 2010 and 2013 by the Institution of Civil Engineers, UK, the BGA medal in 2010 given by British Geotechnical Association, the Shamsheer Prakash Research Award in 2006, Medical Innovations Award in 2007 the IGS-AIMIL Biennial award in 2008 and the Bill Curtin Medal in October 2009 by the Institution of Civil Engineers, UK, IGS-Dr Shamsheer Prakash Award in 2017 for his contributions in the area of Soil Dynamics, Tsunami's and Earthquake Engineering, and the John Henry Garrod King Medal in 2026 by the Institution of Civil Engineers, UK for his research on integral bridge abutments. He has 215+ Journal Publications and 320+ papers in International conferences and workshops to date. He has authored a very successful book on the Design of Pile Foundations in Liquefiable Soils (Imperial College Press) and Geotechnical Chapters in the book on Designing to Eurocode 8 (Taylor & Francis). His new book on Centrifuge Modelling for Civil Engineers has been published by Spon Press/Taylor and Francis publishing group.



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**Room 3574 (Lift 27/28),
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