

ADDRESSING THE “SITE” CHALLENGE IN ESTIMATION OF SOIL PROPERTIES

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Geotechnical design is site-specific, because every site has its unique geological characteristics. This site-specific aspect of geotechnical design can be found in transformation models that relate a measured value (e.g., Standard Penetration Test or SPT blow count N) and a design value (e.g., undrained shear strength s_u). An example is s_u (kPa) = $6 \times N$. It is well known that transformation models are potentially site-specific. This means the factor 6 in the above example is site dependent. In structural design, only loadings can be site-specific. The resistances are not site-specific, because structural materials are manufactured.

It is obviously desirable to adopt a site-specific transformation model constructed by site-specific site investigation data in a design project. However, for small projects where the budget does not justify extensive site investigation, it is typically not possible to construct the site-specific transformation model with sufficient confidence (in the statistical sense).

This lecture presents the “site” challenge, which is to determine the best site-specific estimator (least biased and smallest 95% confidence interval) of a design property based on limited site data and a significantly larger generic database compiled from comparable regional/global sites.



Kok-Kwang Phoon is Distinguished Professor and Vice Provost at National University of Singapore. He is a Professional Engineer in Singapore and past President of the Geotechnical Society of Singapore. His main research interests include statistical characterization of geotechnical parameters and reliability-based design in geotechnical engineering. He is the recipient of numerous research awards, including the ASCE Norman Medal in 2005, the NUS Outstanding Researcher Award in 2010, the John Booker Medal in 2014, and the Humboldt Research Award in 2017. He is the Founding Editor of Georisk Journal, Board Member of the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE), and Vice-President of the International Association for Computer Methods and Advances in Geomechanics (IACMAG). He was elected as a Fellow of the Academy of Engineering Singapore in 2012.