Keynote Address 3

Prof. H. S. Thilakasiri
B.Sc., Eng. (Moratuwa), M.Sc.(Lond), DIC, PhD (South Florida), C.Eng., FIE, P.Eng.(SL)
Senior Lecturer,
Department of Civil Engineering, University of Moratuwa,
Moratuwa 10400, Sri Lanka.

GETTING READY TO FACE FUTURE CHALLENGES IN FOUNDATION ENGINEERING IN SRI LANKA

Foundation is the key interface element between the superstructure and the ground which facilitates safe transfer of superstructure loads to the ground. Failure of the foundation of a structure either due to shear failure of the ground or excessive settlement makes the structure unusable. Therefore, having a sound foundation is a prerequisite to any serviceable structure. Increased rate of urbanization has twofold effects on the types of structures constructed: people tend to built tall structures to maximize the use of the available land; and also they tend to build small to medium size structures on very weak grounds. Both these scenarios pose different challenges to foundation engineers. Tall large structures transmit extremely high loads to the ground and the foundations should be capable of resisting such heavy loads whereas small to medium size structures on weak grounds require economical foundation solutions to match the cost of the structure.

Loads from tall structures are generally transmitted to the ground using deep foundations resting on hard layers and in Sri Lanka rock socketed bored and cast in-situ piles are used for this purpose. The metamorphic and igneous bedrock in the southern part of Sri Lanka varies from completely weathered state to unweatherd state with sudden spatial variations in the weathering profile whereas predominantly limestone formations in the northern part of the country contain solution cavities. As a result, identification of the weathering state of the bedrock during construction of bored piles is a very important aspect and recent studies show that failure to identify the weathering profile has very often led to failure of piles during testing process. In addition, improper cleaning of the pile toe has resulted in very low carrying capacities of bore piles and defects in the pile shaft due to improper construction practises have lead to structural failure of piles as well. Therefore, methods to overcome such defects in piles play a very important role in achieving high capacity pile foundations and the associated methodologies will be discussed.

State of the art load and integrity testing of piles have been introduced to Sri Lanka in the recent past. However, lack of information gathered from traditional static load tests and carrying out such tests in congested sites are common difficulties faced by foundation engineers in Sri Lanka. Furthermore, relying on design methods developed in other countries to suit their ground conditions is a major drawback in designing economical high capacity pile foundations. These shortcomings in the piling industry will be critically reviewed based on the available research findings and suggestions will be made to face future challenges.

Small and medium size structures including residential buildings, constructed in certain parts of the highly populated western coastal belt of Sri Lanka underlain by soft cohesive soils, show various forms of distress and have already caused immense difficulties to the occupants. Use of weak ground conditions for construction activities will increase with the demand for land and providing economical foundation solutions to such problematic ground conditions is another major challenge faced by foundation engineers. Merits and limitations of the currently used techniques such as preloading, partial replacement, sinking concrete cylinders will be discussed. Furthermore, use of short undreamed piles and auger-cast piles to transfer superstructure loads to cohesionless soil layers underlying problematic soft cohesive soil layers will also be discussed.