Research Project Highlight

Towards Next Generation P-Y Curves – Part 1: Evaluation of the State of Art and Identification of Recent Research Developments and Potentials

Project # NCTRKA

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Abstract
Deep pile foundation systems are an integral, albeit costly, component of our urban living and infrastructure system, especially in megacities such as New York and Los Angeles. The daily operational performance (and maintenance) of both the super- and sub-structure systems is paramount in influencing the structure's integrity and its service life, particularly when subject to severe hazard events. The proposed research program will consist of a well-coordinated literature study of analytical, model scale and large scale deep foundation systems under lateral loading with the objective to (i) identify limitations with existing *p-y* curves & *p-y* design recommendations, (ii) summarize recent research that can help address these limitations, and (iii) identify additional research needs required to formulate *Next Generation P-Y (NGPY*) relations. The specific outcome consists of a comprehensive report which will compile foundation studies performed in the last 40 years and help develop a new set of "*Next Generation P-Y Curves*" in the near future.

Deliverables
A comprehensive PEER report summarizing the research findings along with an identification of future research needs. In addition we intend to present findings at a suitable conference in form of a paper or presentation.

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Research Impact

In many areas of the U.S., the design of deep foundation systems for large (e.g., bridges and tall buildings) and movement-sensitive structures (e.g., machine supported foundations) is governed by increasingly complex, multidirectional loading demands and interaction mechanisms resulting from a combination of axial and lateral loading imposed by wind forces, earth pressure, and/or seismic excitation and foundation interaction. While the approach to design for axial loading has been well established and thoroughly tested, methodologies for lateral and combined loading mechanisms have received much less attention. The most frequently used lateral soil-pile interaction relationships (i.e., *p-y* curves) were developed for static and slow cyclic loading conditions using a limited range of soil and structural systems. Extensive research efforts have produced considerable progress in advancing our understanding of individual *p-y* curve parameters; however, most commonly used *p-y* formulations (e.g., in API RP 2A, 2000) have not experienced significant revisions since their formulation more than 40 years ago. In order to systematically address the lack of "state of the art recommendations" for *p-y* formulations and to improve the safety and economy of lateral pile design in non-liquefiable soils, this project will approach the research need identified above by producing a comprehensive document that lays an important foundation for the development of *Next Generation P-Y Curves* in the future. Along with a state of the art assessment of existing knowledge and research progress, the project publications will highlight and propose future research needs and efforts. Additionally, generated publications will facilitate a better transfer of existing knowledge into the practicing geotechnical community, as current research progress on deep foundation systems has only experienced slow and limited industry integration.

Project Image

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