

Contribution to the study and dynamic lateral response of piles

The scope of the present dissertation is to gain knowledge regarding the nonlinear interaction of the pile-soil system under static and dynamic loading. In addition, it contributes to the development of a macroelement for the response of the pile-soil system which takes into consideration the possible nonlinear mechanisms of the response. For this reason, a constitutive model for the lateral cyclic response of piles embedded in cohesionless soil is developed, which will become the base for the calibration of the macroelement and with which the cyclic and dynamic response of pile-soil systems is investigated. Furthermore, analytical expressions for the failure surface for axial loading N , lateral loading Q and overturning moment M and the plastic flow rule are developed. These analytical expressions are validated both numerically with simplified and advanced models and with experiments. The dissertation focuses on understanding the influence of key elements to the pile-soil interaction, such as the pile-to-pile interaction for nonlinear soil response and the development of plastic hinge at the pile foundation.