

Foreword

In foundation engineering, the term “soil-structure interaction” (or SSI) is typically used to identify the mechanical process upon which, after a change of the external loads, an engineering structure, its foundations and the soil interacting with them reach a (static or dynamic) equilibrium state. The key feature of a SSI process is that its results, in terms of stresses, strains and displacements, depend on the mechanical response of both the structural elements and the soil mass, which can be highly nonlinear, inelastic and, in some cases, rate-dependent.

Due to the progresses made in the last decades in the development of sophisticated analysis tools capable of dealing with complex nonlinear quasi-static and dynamic problems, and to the parallel exponential growth in available computer power, the importance of SSI effects in specific fields of applications such as earthquake engineering is now fully appreciated, as it is witnessed by the recent evolution in Italian design codes.

However, the spectrum of relevant geotechnical problems where a careful evaluation of SSI effects can be important extends well beyond geotechnical earthquake engineering. To cite only a few examples, relevant progresses have been made in shallow footing design with respect to serviceability limit states with the introduction of the simple, yet very powerful concept of macro-element. In parallel, the urgent need for the development of underground transportation infrastructures in urban areas has progressively changed the design practice for tunnels or deep excavations, where the main attention of the designer is nowadays focused on the accurate prediction of ground movements induced in the vicinity of the excavation and in the measures to be undertaken to keep them to an acceptable level. Finally, SSI design tools originally developed for earthquake engineering applications can be easily adapted to the analysis of such environmental problems as the quantitative evaluation of the effects of ground vibrations, produced, e.g., by traffic loads or blasting, in terms of damage to adjacent structures or annoyance to people.

In view of the recent developments mentioned above and of the large spectrum of potential applications of SSI concepts, in the meeting of October 2005, the ALERT Board of Directors decided to dedicate one of the 2006 ALERT Workshops to “Soil-Structure Interaction”. This workshop, attended by a large number of researchers from many different European countries, provided a fairly good picture of the current state of the art in the analysis of SSI problems in various fields of geotechnical engineering.

As organizers of the Workshop, we have been asked by the Chief Editor of the «Rivista Italiana di Geotecnica» to invite some of the participants to publish their work in a more extended and detailed form. In the process of selection of potential contributors, we tried to keep the range of practical applications discussed as large as possible. This special issue of the RIG collects their contributions, ranging from SSI analysis of shallow and deep foundations, slope stabilization measures, deep excavations and blasting-induced vibrations.

In closing, we would like to express our sincere gratitude to the Chief Editor of the RIG, Prof. Roberto Nova, for promoting this initiative and to all the Authors for their valuable contributions.

The Guest Editors

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