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**SOIL-STRUCTURE INTERACTION:  
CALCULATION METHODS  
AND ENGINEERING PRACTICE**

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**Volume 1**

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## PREFACE

Current trends in construction are directed mostly at complex reconstruction of buildings and reorganisation of the existing production facilities. There is a boost in high-rise and subsurface construction in cities, including those of historical value.

Previously, rather effective methods had been developed for calculating superstructure and the underlying subsoil, most effectively utilizing computational facilities of the time. However, simplified methods have proved unacceptable for solution of a whole range of construction and reconstruction problems.

A famous philosopher Friedrich Nietzsche wrote a treatise entitled *On the Uses and Disadvantages of History for Life*. In this respect our criticism should not be viewed as being in disregard of history. It must be reiterated that the methods in question were a product of their time and have doubtless served the good cause of designing many a structure, not excluding those unique even by today's standards. It was in the most recent years that alongside evolvement of faster computation facilities and highly effective mathematical methods to solve large systems of equations a possibility emerged to endeavour a further development in solution of spatial problems of soil-foundation-structure interaction.

Soil-structure interaction is a field of the science on construction and calculation practice which unites structural and soil mechanics. The necessity of this unification has always been evident (no building could avoid subsoil interaction) but its practical implementation faced almost irresistible calculation difficulties. Dramatic change of computation equipment capabilities within the recent 10-15 years has created premise for realization of coupled soil-structure interaction calculations by PCs.

3D SSI models which allowed to deny former approximated calculation methods employing subgrade reaction have been developed.

There have been considerable achievements in this field accomplished by the leading geotechnical schools of the world, which fact is thoroughly corroborated by the papers published in the present proceedings. Evolvement of novelty software can ensure the fact that in the nearest future combined calculations will become a part and parcel of the design domain as well as the most important scientific instrument for seeing whole construction process safely through to completion.

The capability to render an urgent modelling of any complex construction situation will permit of a fuller use of the most recently acquired in-situ information.

Soil-structure interaction calculations have become highly relevant for building and structural design in complicated ground conditions. Differential subsoil deformations significantly affect

quality and quantity assessment of structural force distribution and ignoring of this effect poses threat for building safety assurance.

Not surprisingly that St. Petersburg – the city well-known among geotechnical engineers for both its famous architectural ensembles and quite complicated ground conditions – has become the center of soil-structure interaction calculations development. Nowadays St. Petersburg engineers have created the required base for overall endorsement of coupled SSI calculations in 3D mode with account of non-linear behaviour of soil and structures in design.

The role of soil mechanics will correspondingly increase as it will aspire to be an information pool providing prediction accuracy of geotechnical calculations, as it is on those calculations that the actual stressed-strained superstructure condition depends.

Reliable initial data is the key to solution of the most critical problems essential for successfully managing risks at various design and construction stages. That approach will permit to bring together structural and geotechnical engineers at both initial and final stages of construction projects.

We hope that the conference will promote fruitful cooperation as well as sharing of ideas and experience in the field of soil-structure interaction calculations and give additional impetus for intensive development of these relevant issues.

Professor V.M. Ulitsky,  
Editor of the Proceedings

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