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PREFACE

Recently new tendencies have been formed in construction practice being typical for many countries, viz.:

- construction of high-rise buildings and underground structures;
- congesting construction in urban conditions using new dredged areas;
- development of modern urban transport infrastructure including highways, bridges and tunnels;
- preservation and reconstruction of historic buildings.

It may be noted that irrespectively of a city or a country, numerous technical problems related to realization of the above tendencies arise in connection particularly with the geotechnical element in any simple or complicated project.

Rather effective methods of calculations for structures including foundations and their subsoils had been developed in previous years. Unfortunately, the theories behind these methods does not handle properly the complicated systems that are being constructed nowadays. There is a call and a need for necessary inclusion of combined soil-structure interaction (SSI) calculations. At the design stage such calculations enable one to optimize dimensions of structures while utilizing the mechanical resources of soil in full. Undoubtedly, a whole range of problems appears in that respect that should be solved by common efforts of specialists in site investigation, geotechnical engineering and superstructure engineering. It is only by such common effort that the possibility will arise to implement modern architectural fantasies such as super-tall buildings, super-long bridges, and super-large underground structures. Complications tend to amass suddenly and profusely, like an avalanche, and the level of research both theoretical and applied does not always appear to be adequate. Undoubtedly, private construction companies are eager to finance research that will give quick results for certain projects. Global Fundamental studies, however, should be taken care of by public agencies capable of solving such a kind of universal problems, providing their people with dignified life in "full accordance with nature". Now it is time when geotechnics and geotechnologies should embody this important principle at all stages of project implementation. The time when people tried to get everything possible from nature to provide for their momentary needs is passed. The world pays dearly for indifference to nature and for negligence in preserving its wealth for next generations.

All papers, lectures and reports submitted for inclusion into the proceedings meet the requirement for such 'environmental reasonableness'. Environmental issues are crucial to survival of human beings.

What are the problems that should elicit special attention from scientists, designers and all engineers who take part in creation and implementation of construction projects?

1. Site investigation should primarily be carried out as requested by designers, or even specialists in construction calculations and numerical modeling of complicated construction situations. Soil mechanics has actually become a data base for combined calculations of the entire system "subsoil – foundation – superstructure". It is obvious that the procedure of sample taking will benefit from an improvement and a system of laboratory modeling should be developed with the purpose of getting main strength and deformation parameters of soil to enable

reliable predictions. The pressing need for obtaining universal rheological soil parameters for all specialists in geotechnics and calculations is upon us. Otherwise, 17 calculation teams from different countries will calculate 17 different sets of values on stress-strain condition of soils and stress parameters of structures. And all of them will differ from the measured ones, as was the case related to a well known construction pit in Berlin. Moreover, the main calculated parameters in that case differed by a factor of one magnitude from the measured values, what is certainly dangerous and adds uncertainty to the theory of numerical modeling.

2. Global licensing system of all construction software seems absurd. Tested and calibrated individual software products should be used. Calculations should be assigned to a purposefully designated specialist who will be vested with a right to choose from software products either available on the market or one of his own making. A system of monitoring will help to confirm whether calculation results conform to the actual data and if necessary will help correcting the design. In all cases geotechnical science is provided with a real tool for risk management. A principle of interactive monitoring based on the observational method remains a reliable base for safe construction and risk minimization.

3. A multitude of problems, primarily of geotechnical nature, are discussed in the present collection of papers. These problems are the focus of work dealt with by the ISSMGE Committees, including TC-38 "Soil-structure interaction" and TC-41 “Geotechnical Infrastructure for Megacities" that organized this conference.

It is not a coincidence that in such city as St. Petersburg – famous for its architectural ensembles and well known for its complicated ground conditions – soil-structure interaction calculations and active monitoring are being developed so actively. Nowadays in St. Petersburg and Moscow, as also in many other world cities, 3-D SSI calculations, including analyses of non-linear behaviour of subsoil and foundations, are being included into day-to-day design practice.

We hope that the conference held in the oldest Russian educational institution of engineering and transport (which is 200 years old) will promote fruitful interchange of SSI calculation experience in cities of the world, including unique megacities.

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"Geotechnical Infrastructure of Megacities and New Capitals"

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Table of contents

Volume 1

Key-note lectures

Session 1. Soil-structure interaction