



CAETS



EDITOR-IN-CHIEF'S WORD

Dear readers,

It has become a tradition that in its Bulletin the Croatian Academy of Engineering presents scientific achievements of its members and associates to the wider world.

The printed and electronic edition of this issue has been edited by our guest editor Meho Saša Kovačević, a prominent member of the Academy as well as the Secretary of the Department of Civil Engineering and Geodesy.

I believe that you will be interested in reading the presented contributions.

Editor-in-Chief

Vladimir Andročec, President of the Croatian Academy of Engineering



EDITOR'S WORD

Dear readers,

In this edition of HATZ Bulletin Engineering Power we continue to present excellent research groups of the University of Zagreb that – in their professional activities – adopt a multidisciplinary approach, combining best practice of the 'traditional' engineering methodologies with new and emerging technologies.

The Guest-Editor of this issue is Meho Saša Kovačević, Ph.D., Professor of the University of Zagreb, Faculty of Civil Engineering, Associate Member and Secretary of the Department of Civil Engineering and Geodesy of the Croatian Academy of Engineering.

Editor

Zdravko Terze, Vice-President of the Croatian Academy of Engineering



FOREWORD

Civil engineering is one of the oldest and broadest engineering fields, dealing with the design and construction, but also with the maintenance of the naturally and physically built environment. It includes a vast spectrum of works such as buildings, roads, railways, bridges, canals, dams, sewage systems etc. It is a fact that civil engineering does not develop at the same progressive rate as some other engineering disciplines (i.e. mechanical, electrical or computing engineering) where new discoveries are introduced practically on a daily-basis. The objective reasons for this are to be found in the nature of civil engineering which has been developing gradually not for centuries, but for millenniums. However, the implementation of numerical codes, modernization of investigation and testing equipment, much more powerful construction machines have all led to the implementation of innovative techniques and technologies in civil engineering over the last few last decades. At the same time, cities worldwide rapidly developed and the rate of urbanization is so high that by 2050 two-thirds of the world's population will live in urban areas. Safe and quality civil engineering works are therefore not desirable but crucial. At the same time, while our cities grow, our existing infrastructure continuously age and deteriorate and there is a strong need to maintain and even to improve its level of safety and functionality. Geotechnical engineering, as one of the branches within civil engineering, is somewhat specific. Since that all civil engineering works are in some way connected to soil and rock, challenges which geotechnical engineers need to face are numerous, mainly due to the fact that they deal with materials of characteristics which need to be investigated, unlike concrete, steel or wood, whose characteristics are well known to the designer.

The papers listed below represent a part of the scientific and professional work of experts of the Department of Geotechnics, Faculty of Civil Engineering, University of Zagreb. The Department of Geotechnics is one of nine departments of the Faculty of Civil Engineering and it is organised in two chairs, the Chair for Soil and Rock Mechanics and the Chair for Geotechnical Engineering. Through investigation works, design, quality control, consultancy services and scientific-research work the Department has a strong influence on current and future trends in geotechnical engineering both at the national and international level. The first paper presents several innovative technologies and techniques in geotechnical engineering such as non-destructive testing methods, utilization of industrial waste in sustainable soil improvement, use of geotechnical structures for the utilization of geothermal energy and risk management which is more often implemented in geotechnical engineering, especially when there is a need for a rational decision-making process conducted by the infrastructure managers/owners. All these technologies and techniques emerged in the last several decades and clearly represent the trends in geotechnical engineering. The second paper presents the efforts in safety enhancement of the existing railway infrastructure through the demonstration of activities conducted within the three ongoing H2020 research projects. In these projects, experts of the Department of Geotechnics actively collaborate with researchers (and some of them are co-authors of the paper) and infrastructure managers all around Europe in order to implement and to develop state-of-the-art techniques further and tools in the field of railway infrastructure safety. The last paper presents the possibilities of Unmanned Aerial System (UAS) application in Engineering Practice including the development of 3D models to determine volumes, areas and cross sections in a very short time, which is in most cases the basic information in practical engineering.

Guest-Editor

Meho Saša Kovačević, University of Zagreb Faculty of Civil Engineering