

Lecture Notes in Civil Engineering

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S. C. Kaushik · R. K. Tomar
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Advances in Energy and Built Environment

Select Proceedings of TRACE 2018

 Springer

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Preface

The present global objective in civil engineering is to meet the ever-growing demand to handle rising population, various energy and environmental concerns and safety of structures and inhabitants. The Second International Conference on “Trends and Recent Advancement in Civil Engineering” (TRACE) was hosted by the Department of Civil Engineering on 23rd and 24th August 2018 at Amity University, Noida, Uttar Pradesh, India.

TRACE 2018 focused on advances and rapid evolution of various areas in civil engineering. The conference witnessed participation and presentation of research papers (topical reviews and original articles) from academia, industry experts and researchers from R&D centres from India and abroad. The conference proceedings were classified into five titles:

- Advances in Energy and Built Environment
- Advances in Transportation Engineering
- Advances in Structural Engineering and Rehabilitation
- Advances in Water Resources Engineering and Management
- Advances in Sustainable Construction Materials and Geotechnical Engineering.

The title *Advances in Energy and Built Environment* covers papers on contemporary renewable energy and built environment technologies which include microgrid, rural electrification, viability and reliability aspects of solar photovoltaic, greening of buildings using rooftop solar PV systems and heating and cooling of buildings. For the sake of completeness, the papers on exergy analysis and solar radiation estimation have also been included. All twenty-two papers have been selected for publication. It is believed that this collection will be useful for a fairly wide spectrum of audiences like researchers, application engineers and industry managers.

Changsha, China
Bhubaneswar, India
New Delhi, India
Noida, India

Guoqiang Zhang
N. D. Kaushika
S. C. Kaushik
R. K. Tomar

Acknowledgements

The conference was organized to fulfil the vision of Honourable Dr. Ashok K. Chauhan, Founder President of Ritnand Balved Education Foundation (RBEF), and under the able leadership of Honourable Dr. Atul Chauhan, Chancellor, Amity University, Noida, Uttar Pradesh, India. I am honoured to organize this prestigious conference which connected the world's foremost industries with the topmost academia.

I express my sincerest thanks to all the lead speakers and authors of original research papers for their contribution. I also express my thanks to all the reviewers for their cooperation in the review process. I am happy to express my deep sense of gratitude to our publication sponsor Springer for publishing the conference proceedings.

I express my warm gratitude towards all our sponsors: academic partners: Liverpool John Moores University, UK; National University of Malaysia; industry partner: Defence Infrastructure Planning and Management (DIPM) Council of India; knowledge partners: Institution of Civil Engineers, UK; Indian Association of Structural Engineers (IAStuctE); Women in Science & Engineering (WiSE), India; Indian Geotechnical Society (IGS); and Indian Buildings Congress (IBC); platinum sponsor: Ministry of Water Resources, River Development and Ganga Rejuvenation, Government of India; gold sponsor; J K Cement Ltd.; supporting sponsor: Bentley; HEICO; VCL Group; BL Goel & Co.; Subham Builders; Innovative Construction and Consultants; Satya Sai Builders and Contractors Pvt. Ltd.; Megde India Projects (OPC) Pvt. Ltd., etc.

Finally, I compliment my team for their hard work and enthusiasm to make TRACE a success story. I am confident that TRACE 2018 will allow exciting and meaningful conversations, partnerships and collaborations in construction technology and infrastructure growth.

Dr. R. K. Tomar
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About the Editors

Dr. Guoqiang Zhang is a professor at Hunan University, China, where he is currently the dean of Institute for Sustainable Urbanization and Construction Innovation. He is also the director of the National Center for International Research Collaboration in Building Safety and Environment of Ministry of Science and Technology of China, and the deputy director of Key Lab of Building Safety and Energy Efficiency of Ministry of Education of China. He is also a member of the academic committee of Hunan University, and an editorial member of the Journal of Hunan University. Due to his contribution to Sustainable Built Environment Education, Research and Practice, Dr. Zhang received special government allowance from the State Council in China. He has made valuable contributions towards sustainable education and science communication, research, social service and commercialization of scientific and technological achievements.

Dr. N. D. Kaushika formerly professor, Centre for Energy Studies, Indian Institute of Technology Delhi, and subsequently director of reputed engineering institutions in Delhi and National Capital Region, is a specialist in renewable energy and environment. He is a recipient of the Hariom Prerit S. S. Bhatnagar Research Endowment Award for research in energy conservation in 1987. Currently, he is a visiting research professor at the Institute of Technological Engineering and Research of SOA University, Bhubaneswar, India. He is an author of five books and has contributed articles in several reputed journals and books chapters in several books by international publishers.

Dr. S. C. Kaushik received his Ph.D. in Plasma Science from IIT Delhi after his distinguished First Position in Master's degree in science (electronics) from Meerut University. His fields of research include plasma science, thermal science and engineering, energy conservation and heat recovery, solar refrigeration and air conditioning, solar architecture, and thermal storage and power generation. He has made significant contributions in these fields as evident by his about 500 research articles in journals of repute at the national and international level. He is a pioneer in exergy analysis and finite time thermodynamics of energy systems, and a leading

expert on alternative refrigeration and air conditioning technologies. Dr. Kaushik has co-authored ten books and also edited two volumes. His specific contributions to energy systems have been recognized by several awards to his credit viz. Young Scientist UNESCO Award, Hariom Prerit S. S. Bhatnagar Award, Divyajyoti Science and Technology Award, Top Academic Research Performer in Energy, Dr. A. P. J. Abdul Kalam Gold Medal Research Award and outstanding Research Faculty Award in India. He is Member of ISES (Australia) and IIR (France), and a Life Member of various other professional societies like SESI, PSSI, ISTE, ISHRAE and ISME. He has been former Head, Centre for Energy Studies 2007–2010 and at present Emeritus Professor at CES, IIT Delhi.

Dr. R. K. Tomar received his Ph.D. from the Indian Institute of Technology (IIT) Delhi and is currently, Head of the Department of Civil Engineering, Amity School of Engineering and Technology, Amity University, India. His research interests include artificial intelligence applications in buildings and sustainable built environment. He has a combined experience of 27 years in industry and academia in various capacities. He has published several research articles in international peer-reviewed journals.