

“ We gratefully acknowledge the contribution of our editorial board, their commitment and their exemplary support. ”

Editor-in-Chief



Prof. Dr Vasant Matsagar
Indian Institute of Technology (IIT) Delhi, India

Associate Editors



Prof. Dr Manu Santhanam
Indian Institute of Technology (IIT) Madras, India



Prof. Dr Valdir Pignatta e Silva
University of Sao Paulo, Brazil



Prof. Dr-Ing Akanshu Sharma
University of Stuttgart, Germany / Purdue University, USA



Mr Sunil Bhatt
Head-Customer Service, ACC, India

Editorial Board Members



M. Christophe Levy
Scientific Director, LafargeHolcim Innovation Center Lyon, France



Dr Subramanian Narayanan
Consulting Engineer, Gaithersburg, USA



Prof. David Lange
University of Queensland, Australia



Prof. Saverio Spadea
University of Dundee, UK
Polytechnic University of Bari



Prof. Dr Ghani Razaqpur
McMaster University, Canada / Nankai University, China



Prof. Dr Abass Braimah
Vice Chancellor (VC), Tamale Technical University, Ghana



Prof. Dr Esayas Gebre-Youhannes
Addis Ababa Institute of Technology (AAiT), Addis Ababa University, Ethiopia



Prof. Dr S. Suriya Prakash
Indian Institute of Technology (IIT) Hyderabad, India



Prof. Dr Vistasp Karbhari
The University of Texas at Arlington, USA



Dr Pravin Jagtap
Editorial Curator Indian Institute of Technology (IIT) Delhi, India

“ We gratefully acknowledge the contribution of our guest editors, their commitment and their exemplary support. ”

GUEST EDITORIAL GROUP:



Dr Anusha S. Basavaraj
Indian Institute of Technology (IIT) Madras, India



Prof. B. Bhattacharjee
Indian Institute of Technology (IIT) Delhi, India



Dr Bibhuti Bhusan Das
National Institute of Technology (NIT) Karnataka, Surathkal, India



Dr Bijily Balakrishnan
Indian Institute of Technology (IIT), Tirupati, India



Dr Chetan Hazaree
HOLCIM, France



Prof. Christopher K.Y. Leung
Hong Kong University of Science and Technology, Hong Kong



Dr Damodar Maity
Indian Institute of Technology (IIT) Kharagpur, India



Prof. Devdas Menon
Indian Institute of Technology (IIT) Madras, India



Dr Dhanada K. Mishra
RaSpect AI, Hong Kong



Dr Dinakar Pasla
Indian Institute of Technology (IIT) Odisha, India



Prof. Duo Zhang
Research Scientist,
University of Michigan, USA



Dr Dyana Joseline
Larsen Toubro, India



Prof. Ing Jiabin li
Department of Engineering,
KU Leuven, Belgium



Dr Jing Yu
Hong Kong University of Science and Technology, Hong Kong



Dr Radhakrishna Pillai
Indian Institute of Technology (IIT) Madras, India



Dr Ravindra Gettu
Indian Institute of Technology (IIT) Madras, India



Dr Romanbabu Oinam
Indian Institute of Technology (IIT) Guwahati, India



Prof. Satadru Das Adhikary
Indian Institute of Technology (Indian School of Mines), Dhanbad, India



Dr Sekhar Chandra Dutta
Indian Institute of Technology (Indian School of Mines), Dhanbad, India



Dr Sivakumar Kandasami
Larsen & Toubro,
Chennai, India



Prof. Victor C. Li
University of Michigan, USA

REVIEWERS GROUP:



Mr A. K. Jain
A. K. Jain Associates,
Mumbai, India



Prof. A. K. Singh
SVPKM's Shri Bhagubhai Mafatlal
Polytechnic, Mumbai, India



Dr A. V. Rahul
Indian Institute of Technology
(IIT) Tirupati, India



Dr Abhay Bambole
Veermata Jijabai Technological
Institute (VJTI), Mumbai, India



Prof. Dr Ajay Goyal
Chitkara University, Himachal
Pradesh, India



Dr Ajay Kumar
National Institute of Technology
(NIT) Patna, India



Dr Ajoy Kumar Mullick
National Council for Cement and
Building Materials (NCCBM),
New Delhi, India



**Jun. Prof. Dr-Ing.
Akanshu Sharma**
University of Stuttgart, Germany



Mr Alok Bhowmick
B&S Engineering Consultants
Pvt. Ltd, Noida, India



Dr Amlan K. Sengupta
Indian Institute of Technology
(IIT) Madras, India



Dr Anil Agarwal
Indian Institute of Technology
(IIT) Hyderabad, India



Dr Arvind K. Suryavanshi
University of Manchester, UK



Dr Ashish kumar Dash
Amity School of Engineering and
Technology Gurgaon, India



Dr Ashutosh Dabli
Vidyavardhini's College of
Engineering & Technology
Mumbai, India



Dr Avik Samanta
Indian Institute of Technology
(IIT) Patna, Bihar, India



Dr Aysha Zeneeb Majeed
Rajagiri School of Engineering &
Technology Kerala, India



Prof. B. N. Rao
Indian Institute of Technology
(IIT) Madras, India



Dr B. R. Patagundi
S. G. Balekundri Institute of
Technology Belgaum, India



Dr B. S. Dhanya
Rajiv Gandhi Institute of
Technology Kottayam, India



Prof. B. Vijaya Rangan
Curtin University, Australia



Dr Babita Saini
National Institute of Technology
(NIT) Kurukshetra, India



Dr Bahurudeen A.
Birla Institute of Technology and
Science (BITS) Pilani-Hyderabad,
India



Dr Benny Raphael
Indian Institute of Technology
(IIT) Madras, India



Dr C. D. Modhera
Sardar Vallabhbhai National
Institute of Technology (SVNIT)
Surat, India



Dr C. Rajasekaran
National Institute of Technology
(NIT) Karnataka Surathkal, India



Dr C. S. Suryawanshi
Structural Consultant, India



**Prof. Cameron J.
Churchill**
McMaster University, Canada



Prof. Chiragbhai C. Patel
Sir Padampat Singhania
University Udaipur, India



Dr Christian J. Engelsen
University of Oslo, Norway



Dr D. Ravi Prasad
National Institute of Technology
(NIT) Warangal, India



Prof. Dasaka S. Murty
Indian Institute of Technology
(IIT) Bombay, India



Dr Dipti Ranjan Sahoo
Indian Institute of Technology
(IIT) Delhi, India



Dr En-Hua Yang
Nanyang Technological
University, Singapore



Dr Erfan Najaf
Islamic Azad University South
Tehran Branch, Iran



Dr Gopal L. Rai
Dhirendra Group of Company,
Mumbai, India



Dr Goutam Mondal
Indian Institute of Technology
(IIT) Bhubaneswar, India



Prof. Dr Harald Justnes
SINTEF Community, Norway



Dr Harikrishnan Nair
Virginia Transportation Research
Council (VTRC), USA



Dr Hindavi Gavali
National Institute of Construction
Management and Research
(NICMAR) University Pune,
India



Dr Indu Geevar
Rajagiri School of Engineering
and Technology Kochi, India



**Dr Indu Siva Ranjani
Gandhi**
Indian Institute of Technology
(IIT) Guwahati, India



Er J. D. Buch
Consultant, Gujarat, India



Dr Jayachandran K.
National Institute of Technology
(NIT) Calicut, India



Dr K. A. Patil
Government Engineering College
Pune, India



Dr K. Anbuvelan
Sai Structural Engineers,
Tamilnadu, India



Dr K. B. Prakash
Government Engineering College,
Haveri, India



Dr K. Balasubramanian
Hitech Concrete Solutions,
Chennai, India



Dr K. Praveen
Chaitanya Bharathi Institute of
Technology Hyderabad, India



Prof. K. Rambabu
AU College of Engineering,
Andhra Pradesh, India



Dr K. S. Elango
KPR Institute of Engineering &
Technology Coimbatore, India



Dr K. V. Harish
Indian Institute of Technology
(IIT) Kanpur, India



Dr Kamal Kant Jain
Indian Institute of Technology
(IIT) Delhi, India



Dr Kaushal B. Parikh
Government Engineering College,
Dahod, India



Prof. Kaustabh Dasgupta
Indian Institute of Technology
(IIT) Guwahati, India



Dr Kaustav Sarkar
Indian Institute of Technology
(IIT) Mandi, India



Dr Khuito Murumi
Nagaland Public Works
Department, India



Dr Kim Hung Mo
University of Malaya, Malaysia



**Prof. Kolluru V. L.
Subramaniam**
Indian Institute of Technology
(IIT) Hyderabad, India



Dr Kondraivendhan B.
S.V. National Institute of
Technology (NIT) Surat, India



Dr Krishna R. N.
Sole Proprietor-KC Contech,
Chennai, India

THANK YOU



Prof. Kumar Neeraj Jha
Indian Institute of Technology (IIT) Delhi, India



Prof. L. Boeing Singh
Indian Institute of Technology (IIT) Guwahati, India



Dr M. C. Nataraja
Bapuji Institute of Engineering and Technology Davanagere, India



Dr M. Chakradhara Rao
Indian Institute of Technology (IIT) Kharagpur, India



Dr M. M. Murudi
Sardar Patel College of Engineering, Mumbai, India



Dr M. N. Shariff
Indian Institute of Technology (IIT) Bombay, India



Dr M. Sunil Singh
National Institute of Technology (NIT) Manipur, India



Dr Madappa V.R. Sivasubramanian
Indian Institute of Technology (IIT) Puducherry, Karaikal, India



Prof. Mahesh Tandon
Tandon Consultants Pvt. Ltd. New Delhi, India



Dr Maneek Kumar
Thapar Institute of Engineering and Technology Punjab, India



Prof. Manoj Kumar
Birla Institute of Technology and Science (BITS) Pilani, India



Dr Miss Meera
Dr Vishwanath Karad MIT World Peace University, Pune, India



Prof. Mukesh Limbachiya
Kingston University London, UK



Dr Murugan Muthu
Wroclaw University of Science and Technology Poland



Prof. Dr Mustafa Şahmaran
Hacettepe University, Turkey



Dr N. Ganesan
National Institute of Technology (NIT) Calicut, India



Dr N. P. Rajamane
Founder & Former Head - Centre for Advanced Concrete Research, Chennai, India



Prof. Nagesh Iyer
Indian Institute of Technology (IIT) Dharwad, India



Dr Nakul Gupta
GLA University, Mathura, India



Dr Navdeep Singh
Dr. B. R. Ambedkar National Institute of Technology (NIT) Jalandhar, India



Dr O. R. Jaiswal
Visvesvaraya National Institute of Technology (VNIT) Nagpur, India



Dr P. Gajalakshmi
B.S. Abdur Rahman Crescent Institute of Science and Technology Chennai, India



Dr P. R. Kalyana Chakravarthy
Vels Institute of Science, Technology & Advanced studies, Old Pallavaram, Chennai, India



Dr P. Srinivasa Rao
JNTUH College of Engineering, Hyderabad, India



Prof. P. V. Ramana
Malaviya National Institute of Technology (MNIT) Jaipur, India



Dr Piyush Chaunsali
Indian Institute of Technology (IIT) Madras, India



Prof. Potharaju
Gandhi Institute of Technology and Management (GITAM), Visakhapatnam, India



Dr Pradip Sarkar
National Institute of Technology (NIT) Rourkela, India



Dr Prakash Nanthagopalan
Indian Institute of Technology (IIT) Bombay, India



Dr Prakash Sangamnerkar
M.P. Housing & Infrastructure Development Board, Bhopal, India



Prof. Prannoy Suraneni
University of Miami, USA



Dr Prasanna Kumar Acharya
Kalinga Institute of Industrial Technology (KIIT) Deemed University, Bhubaneswar, India



Dr Prashanth Janardhan
National Institute of Technology (NIT) Silchar, India



Dr Praveen Kumar Agrawal
Rajasthan Technical University, Kota, India



Dr Priyanka Jadhav
Terna Engineering College, Navi Mumbai, India



Dr Putul Haldar
Indian Institute of Technology (IIT) Ropar, India



Dr Radhakrishna
R. V. College of Engineering, Bengaluru, India



Dr Rahul V. Ralegaonkar
Visvesvaraya National Institute of Technology (VNIT) Nagpur, India



Dr Rajan L. Wankhade
Netaji Subhas University of Technology New Delhi, India



Dr Rajeevan B.
Government College of Engineering Kannur, Kannur, Kerala, India



Dr Rakesh Kumar
Council of Scientific & Industrial Research - Central Road Research Institute, Delhi, India



Dr Ramaswamy K. P.
TKM College of Engineering, Kerala, India



Dr Ratnesh Kumar
Visvesvaraya National Institute of Technology (VNIT) Nagpur, India



Prof. Ravande Kishore
Maharashtra Institute of Technology Pune, India



Dr Roberto Torrent
Materials Advanced Services Ltd., Argentina



Dr Robin Davis
National Institute of Technology (NIT) Calicut, India



Dr S .C. Maiti
Indian Institute of Technology (IIT) Kharagpur, India



Dr S. B. Vanakudre
Shri Kshetra Dharmasthala College (SDM), Karnataka, India



Dr S. Girish
Bhusanayana Mukundadas Sreenivasaiah College of Engineering Bangalore, India



Prof. Dr S. K. Kaushik
DIT University, Dehradun, India



Dr S. K. Madan
National Institute of Information Technology (NIIT) Kurukshetra, India



Prof. S. K. Singh
Council of Scientific & Industrial Research - Central Road Research Institute, Roorkee, India



Prof. S. P. Singh
Dr. B. R. Ambedkar National Institute of Technology Jalandhar, India



Dr S. R. Karade
Council of Scientific & Industrial Research - Central Road Research Institute, India



Dr S. V. Deodhar
Shri Vaishnav Institute of Technology and Science (SVITS), Indore, India



Dr Sahana Ranganatha
Dayananda Sagar Academy of Technology and Management (DSATM), Bangalore, India



Dr Sandipan Nath Thakur
The University of Burdwan, West Bengal, India



Dr Sangeeta Gadve
Visvesvaraya National Institute of Technology (VNIT) Nagpur, India



Dr Sanjay Kumar
Council of Scientific & Industrial Research - National Metallurgical Laboratory, Jamshedpur, India



Dr Sanjay S. Jamkar
Government College of Engineering, Aurangabad, India

THANK YOU



Dr Sanjay Wakchaure
Indian Academy of Highway Engineers, India



Dr Sanjaya Kumar Patro
Veer Surendra Sai University of Technology Odisha, India



Dr Sanket Nayak
Indian Institute of Technology (Indian School of Mines), Dhanbad, India



Dr.-Ing. Saptarshi Sasmal
CSIR-Structural Engineering Research Centre, Chennai, India



Dr Saroj Mandal
Jadavpur University, Kolkata, India



Dr Senthilkumar Rajendran
National Institute of Technology (NIT) Tiruchirappalli, India



Dr Seshadri Sekhar Tirumala
National Institute of Construction Management and Research, Hyderabad, India



Prof. Shamsheer Bahadur Singh
Birla Institute of Technology and Science (BITS) Pilani, India



Prof. Dr. Sharadkumar Purohit
Nirma University, Gujarat, India



Dr Sharan Kumar Goudar
College of Engineering, Pune, India



Prof. Dr. Shashank Bishnoi
Indian Institute of Technology (IIT), Delhi, India



Dr Shashikala A. P.
National Institute of Technology (NIT) Calicut, Kerala, India



Dr Shinto Paul
Uralungal Labour Contract Co-operative Society Ltd. (ULCC), Kerala, India



Dr Shirish Vinayak Deo
National Institute of Technology (NIT) Raipur, India



Dr Shivaprasad K. N.
JSS Science and Technology University, Mysuru, India



Dr Shubhada Gadkar
National Reality Mixed Concrete Co., USA



Dr Smita Kaloni
National Institute of Technology (NIT) Uttarakhand, India



Dr Somnath Ghosh
Haldia Institute of Technology West Bengal, India



Dr Sooraj A. O. Nair
United States Gypsum Co., USA



Dr Styliani Papatzani
Hellenic Army Academy, Greece



Dr Subhash C. Yaragal
National Institute of Technology (NIT) Karnataka, India



Prof. Sudhir Misra
Indian Institute of Technology (IIT) Kanpur, India



Dr Sumanta Halder
Indian Institute of Technology (IIT) Bhubaneswar, India



Dr Sunitha K Nayar
Indian Institute of Technology (IIT) Palakkad, Kerala, India



Prof. Supratic Gupta
Indian Institute of Technology (IIT) Delhi, India



Dr Surendra Manjrekar
Sunanda Specialty Coatings Pvt. Ltd., Mumbai, India



Dr Suresh R. Dash
Indian Institute of Technology (IIT) Bhubaneswar, India



Dr Sutapa Deb
Indian Institute of Technology (IIT) Kharagpur, India



Dr Suvir Singh
Council of Scientific & Industrial Research - Central Road Research Institute, Roorkee, India



Dr Swathy Manohar
Indian Institute of Technology (IIT) Bombay, India



Dr T. Ch. Madhavi
SRM Institute of Science and
Technology, Ramapuram, India



Dr T. Palanisamy
National Institute of Technology
(NIT) Karnataka, India



Dr T. Sakthivel
PSG Institute of Technology and
Applied Research, Tamil Nadu,
India



Dr Tamizharasi G.
Sardar Vallabhbhai National
Institute of Technology
(SVNIT) Surat, India



Dr Umesh Chandra Sahoo
Indian Institute of Technology
(IIT) Bhubaneswar, India



Dr Urmil Dave
Nirma University, Ahmedabad,
India



Dr V. Sairam
Vellore Institute of Technology,
Tamil Nadu, India



Dr V. V. ARORA
Former Joint Director and Head
(CDR) National Council for
Cement and Building Materials,
Ballabgarh (Haryana), India



Dr V. V. L. Kanta Rao
Council of Scientific & Industrial
Research - Central Road Research
Institute New Delhi, India



**Mr Vaishnav Kumar
Shenbagam**
Indian Institute of Technology
(IIT) Madras, India



Mr Vijay Kulkarni
Midas Techfin Consultants LLP,
Mumbai, India



Dr Vilas V. Karjinni
Kolhapur Institute of Technology,
Kolhapur, India



Prof. Vinh Dao
University of Queensland,
Australia



Dr Visalakshi Talakokula
Mahindra Ecole Centrale School
of Engineering, Mahindra
University, Telangana, India



Prof. Weiyong Wang
Chongqing University, China



Dr Y. Amarnath
P.V.K.K Institute of Technology,
Andhra Pradesh, India



Dr Y. M. Ghugal
Government Engineering College,
Karad, India



Dr Yuvaraj Dhandapani
University of Leeds, UK



**Prof. Dr. Ahmed H.
Alwathaf**
Sana'a University Sana'a, Yemen

“ We gratefully acknowledge the contribution of our reviewers, their commitment and their exemplary support. ”