

Dear Reader

We thank all our reviewers in this edition and acknowledge their exemplary support. We are pleased to bring to you an edition that interests academia and professionals. Our Guest Editor Prof. Devdas Menon has curated this edition with papers discussing structural design and analysis of construction.

Prof. Devdas Menon received his B.Tech. and Ph.D. degrees from the Indian Institute of Technology Madras. He is the Institute Chair Professor in the Department of Civil Engineering at IIT Madras, actively engaged in teaching, research and consultancy in structural engineering, and in developing a holistic approach in education, with emphasis on inner development and transformation.

In engineering, his primary research interests are in the area of structural concrete design. He has also carried out innovative research and development in affordable and sustainable building systems and in biomechanical orthopaedic devices. He has published a large number of technical papers, and received patents and awards. He has a special interest in developing codes of practice, and is presently the Chairman of the Bureau of Indian Standards CED 38 Committee on "Special Structures".

He has a deep interest in teaching and continuing education, and has authored / co-authored several textbooks, titled "Reinforced Concrete Design", "Structural Analysis", "Advanced Structural Analysis" and "Handbook on Seismic Retrofit of Buildings". He has delivered numerous lectures and workshops for students, teachers and corporate organizations, on finding meaning and fulfilment in life through self awareness and inner transformation. He has authored two books called, "Stop sleepwalking through life!" (1998) and "Spirituality at work" (2016). His books have been appreciated widely.

Production Editor
Indian Concrete Journal



Dear Colleague

It is with great pleasure that we bring you this special issue of the Indian Concrete Journal – a journal that has served as an excellent bridge for several decades between research and development activities on one side and design practice and the concrete construction industry in India on the other side.

Concrete can be broadly defined as any solid mass made with the use of a cementing medium. This broad definition provides ample scope for the continual introduction of new materials that result in various kinds of concrete suitable for a wide spectrum of applications. In the realm of structural concrete (reinforced, prestressed and partially prestressed), the key objective is to realise not only the desired strength, but equally important, the desired durability and high performance during the intended service life. Concrete structures need to be designed and built so that they not only have the desired stability, strength and serviceability (with acceptably low risk of failure), but are also aesthetic and economical.

The need to enhance strength and durability of old concrete structures is also becoming increasingly important, calling for the development of appropriate techniques for repair, rehabilitation and retrofit. There is a need for proper understanding of the various mechanisms of degradation in concrete structures, so that appropriate prevention and correction can be applied. There are also increasing incidents of structural failure that call for a proper forensic understanding of all failures. We need to learn from the lessons of the past in order to build a sound, safe and sustainable future. Sustainability also involves minimising the use of higher-energy intensive materials such as cement and steel, as well as increasingly scarce resources such as river sand and potable water.

There is clearly a need for appropriate research and development in materials, analysis, design and construction of concrete structures in our laboratories, with adequate experimental testing and validation, so that all proposed innovations and recommendations for improvements are based on a sound and scientific understanding. It is then possible to introduce these developments in our codes of practice and in the construction industry. The efforts of the Indian Concrete Journal are directed to enabling this understanding and transformation in the Indian context.

In this edition of the ICJ, the theme is primarily on improvements in structural design of concrete slabs and beams. This may, prima facie, appear to be an outdated theme, as it is commonly believed that the structural behaviour of such members, subject to gravity loading, is already well understood,

and the performance of these members, designed by conventional methods, have stood the test of time. However, as shown by two papers in this edition, supported by experimental evidence and theoretical analysis, there is a promise of a more rational understanding, and also scope for achieving economy. One paper establishes that rectangular beam-slab systems, conventionally designed, are generally over-conservative, and demonstrates through practical examples how these can be more rationally and economically designed using appropriate yield line analysis, resulting in significant savings in steel. The other paper shows that the conventional application of yield line analysis to estimate the load capacities of solid and voided slabs tend to be over-conservative (comparing with test results), and can be corrected by appropriately accounting for tensile membrane action and reinforcement orientation. A third paper, based on experimental testing of wide reinforced concrete beams with different stirrup arrangements, demonstrates the importance of using multi-legged stirrups in achieving better crack control and enhanced strength.

An area requiring urgent attention and research is the field of structural retrofit. Several structures need to be strengthened

due to the deterioration caused as a consequence of ageing, increase in the loading demands or due to damage caused by accidental loads. This edition includes two papers on this topic. While one paper reports experimental studies to show that flexural strength enhancement up to 40 percent is possible in reinforced concrete beams wrapped with glass fibre reinforced polymer, another paper presents a case study on a fastening system for external prestressing aimed at strengthening offshore girders weakened by corrosion. Yet another paper discusses different methods to detect damage in reinforced concrete beams.

Finally, we have a 'point of view' article highlighting lessons that we can learn from structural failures, with reference to the collapse of a prestressed concrete truss footbridge in Miami, USA, in 2018.

We thank the authors for their contributions and trust that the readers find these articles informative and useful in practice.

Devdas Menon
Guest Editor, ICJ

TAKE A CONCRETE DECISION



COLLECTOR'S EDITION

Act NOW.

ORDER your copy, TODAY!



Search **THE INDIAN CONCRETE JOURNAL** 

SUBSCRIBE Write to us at : info@icjonline.com or visit our website : www.icjonline.com