

Dear Readers,

We are pleased to share with you papers covering research on various constituents of concrete and the characteristics they impart. This edition is guest edited by Dr Sandip Kumar Saha.

Dr Sandip Kumar Saha is an Assistant Professor in the School of Civil and Environmental Engineering at the Indian Institute of Technology Mandi (IIT Mandi). His research interests include multi-hazard vulnerability assessment of reinforced concrete structures, resilient infrastructure in the hilly region, performance-based earthquake engineering and seismic vibration control. Dr Saha has published more than 50 research articles and edited two book volumes. He is a member of the Indian Society of Earthquake Technology, Indian Association of Computational Mechanics, and is currently serving as an associate editor for the Practice Periodical on Structural Design and Construction, ASCE.

We hope you enjoy reading this edition and look forward to your feedback!

Production Editor  
Indian Concrete Journal



Dear Readers,

Greetings! It gives me immense pleasure to bring out the April 2023 issue of the Indian Concrete Journal (ICJ). Today, concrete is one of the most consumed materials in the world due to its diversified use in the construction industry. As a result, the production of concrete, maintenance of already built concrete structures and newer applications of this material is bringing in multi-dimensional challenges for the researchers and practitioners. This issue of the ICJ consists of five high quality technical articles addressing the above-mentioned challenges.

In search of better quality and superior performance characteristics of the material, mixing different types of fiber with concrete has been practiced for a long time. However, the type of fiber and its mechanical characteristics are evolving continuously. Therefore, it is important to understand the influence of these fiber types and arrangements on the properties of concrete considering the actual application. Wei Xu<sup>[1]</sup> has experimentally studied the influence of glass fiber and basalt fiber grid reinforcements and the reinforcement-cement concrete interaction in pavement concrete. They has discussed the observed failure mechanism in fiber grid reinforced concrete under flexure and reported the superior fatigue performance of fiber grid reinforced concrete in comparison to the plain cement concrete.

While fiber reinforcement in concrete has been adopted in several applications as an effective and optimum choice, use

of traditional reinforcement, i.e., steel rebars, is still the primary choice in day-to-day design. Notably, during the past couple of decades, use of higher grades of reinforcing steel (having yield strength in the range of 500 MPa and above) has become common. Nevertheless, the available design aids in India for quick computation of the design capacity of reinforced concrete (RC) sections, such as SP 16<sup>[2]</sup>, is yet to be updated by including the higher grades of reinforcement. Desai and Subramanian<sup>[3]</sup> have presented design aids for RC circular columns with high strength steel which can be useful for practicing engineers. The lengthy computations, incorporating the axial and flexural interaction, to calculate the design strength, may be avoided by using the proposed design charts.

Due to widespread use of concrete across the globe, the key ingredients of concrete, i.e., coarse aggregate and fine aggregates/sand, are considered among the largest consumers of mined elements<sup>[4]</sup>. This fact has serious implications on the environment, and we need to consider alternatives for achieving sustainable development goals. In recent times, several alternative and supplemental materials have been proposed to reduce the carbon footprint of the cement concrete-based construction. However, their influence on durability of real life structures is yet to be ascertained. Ram<sup>[5]</sup> has compared the properties of sintered fly ash (an industrial waste product) aggregate with current Indian standard specification<sup>[6]</sup> with focus on the durability aspect. Arjun and Hemalatha<sup>[7]</sup> have assessed

the performance of steel slag aggregates as partial replacement of river sand in concrete. It can be noted that such applications have two-way benefits towards sustainable development. One is re-use of the industrial wastes and the second one is by reducing the demand of natural aggregate, thereby reducing the mining related issue. This is high time that extensive research is carried out to find suitable alternative and sustainable materials to meet future demands.

It is not only the new concrete structures that require attention of the researchers, the old and deteriorating concrete structures probably require equal, if not less, attention. As the inventory of the old concrete structures is increasing day-by-day, the effort to maintain them and ensure their structural integrity is one of the major challenges faced by the industry. Therefore, identification of the damages in concrete structure is receiving lots of research attention lately. In this regard, Arulmozhi *et al.*<sup>[8]</sup> have presented a methodology to utilize the capabilities of machine learning algorithms in identification of damages in concrete structures. With a large number of buildings to be assessed, machine learning applications have potential to aid human efforts in this regard.

In nutshell, this issue of the ICJ presents the research contributions covering a wide range of new developments, and applications in the domain of fiber reinforced pavement concrete, design aids, alternative aggregate materials, and damage identification in RC structures. On behalf of the ICJ, I would like to extend our sincere appreciation to the contributing authors who have considered the ICJ for disseminating their research outcomes. The effort and valuable time spent by the reviewers to ensure the high standard of the published articles in a timely manner is gratefully acknowledged. It is hoped that the articles published in this issue will be beneficial to both the researchers and the practicing engineers.

Best Regards,

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