Dear Readers,

I take this opportunity to wish you and your families a very happy Diwali. May this Diwali usher abundance, joy and prosperity for all of you.

The latest edition of the Indian Concrete Journal (ICJ) is curated by Prof. B. B. Das from the National Institute of Technology Karnataka (NITK) Surathkal. He brings to you interesting research papers on the microstructure and durability of sustainable concrete developed using a high volume of mineral admixtures. Prof. Das is a presently a Professor of Civil Engineering at NITK Surathkal. After completing his PhD from Indian Institute of Technology (IIT) Bombay in 2007, he worked for two years as a Post-Doctoral Research Associate at the Centre for Innovative Materials Research (CIMR), Lawrence Technological University, Southfield, Michigan, USA. Before joining NITK, he was the centre head for NICMAR at Goa and Indore. In an era when environmental concerns were at the forefront of global discussions, Prof. Das recognized the urgent need to revolutionize the construction sector and developed Sustainable Construction and Building Materials Laboratory (SCBM Lab) in 2018 at NITK Surathkal. He has co-authored around 100 scientific and technical publications (SCI/ SCOPUS) in the areas of concrete technology.

We thank him for curating this edition and hope our readers enjoy reading them.

Best Regards,

The Production Editor

Dear Readers,

Wishing all our community members a very happy and a prosperous Diwali. In this edition of November 2023, I am pleased to share with our community 6 enriching research papers oriented to sustainability as their common narrative.

In the first paper, Bhaukya Vamsi Naik and co-authors highlight the importance of sleepers in railway track structures. Prestressed concrete sleepers are susceptible to damage during derailment and high-magnitude impact loads. The use of supplementary cementitious materials like fly ash and ground granulated blast furnace slag can increase their energy absorption and load-carrying capacity. The study compares two sleeper models subjected to impact and static bending tests. The results show that the sleeper containing these materials outperforms the ordinary prestressed concrete sleepers.

Second paper is about the steel-concrete interface (SCI) that is a non-homogeneous porous zone and plays a vital role in bond strength as well as to the durability of reinforced concrete structures. However, the thickness of this porous zone is assumed without practical studies. In this study, the thickness was measured experimentally using backscattered electron images. The influence of ground granulated blast furnace slag (GGBS) on the SCI was also investigated. The results showed that the thickness varies along the periphery of reinforcement bar and is reduced by the pozzolanic reaction of GGBS concrete. This, in turn, enhances the ultimate bond strength of high-volume GGBS concrete compared to control concrete.

Third paper presents the effectiveness of fly ash (FA) and ground granulated blast-furnace slag (GGBS) in controlling the heat of hydration, strength, and durability of mass concrete. Five concrete blocks were cast with varying proportions of cement, FA, and GGBFS. The results showed that using 20 and 35% FA, and 50 and 70% GGBS lowered the peak core temperature and increased the strength of cores compared to the ordinary Portland cement-based sample. This is due to lower heat evolution and increased homogeneity of hydrated products and refined pores of FA and GGBS-based samples. Utilizing FA and GGBFS can enhance the durability and sustainability, minimize thermal cracking, and reduce production cost of mass concrete.

The next paper proposes using sustainable concrete with shredded rubber in the tension zone of a reinforced concrete beam to minimize the role of concrete in taking tension. Experimental results show that increasing the quantity of shredded rubber in the mix reduces the strength of the reinforced concrete beam. Mechanical properties are not achieved when fine aggregates in concrete are replaced with more than 160 kg per meter cube of shredded rubber.

Fifth paper uses computational analysis to assess the impact of a blast on a five-story reinforced concrete frame structure at different standoff distances of 5, 10, and 15 meters. Blast loads can cause severe damage to buildings, particularly older ones not designed for such loads. The study's results can help architects, engineers, and designers create structures that can withstand the impact of an explosion and protect occupants from harm. The study contributes to understanding the structural response to blast loads and their influence on a structure.

The final paper of this special issue is written by a group of researchers from USA, led by Bharath Melugiri Shankaramurthy. This study examines the impact of aggregate pore structure on concrete durability, particularly for high-performance concretes. The research explores various techniques to extract quantitative information from aggregate pores and evaluates key pore features. The study highlights the importance of considering aggregate pores in designing high-performance concretes. A summary of methods for aggregate pore structure characterization is also provided as a reference guide for selecting suitable techniques.

In this ICJ themed edition, I have strived to build further awareness and promote sustainable construction in India. We will together continue to share and advance rich knowledge generated in the realm of concrete industry. Please do continue to share the findings and application knowledge in your community groups to make a positive impact in the construction sector.

Best regards,

Prof. Bibhuti Bhusan Das
Guest Editor, ICJ
National Institute of Technology Karnataka (NITK) Surathkal