Dear Readers,

We are pleased to share a second special edition with shortlisted key manuscripts presented in the 18th NCB International Conference and Exhibition on Cement, Concrete and Building Materials held at IICC Dwarka, Delhi in November 2024. These editions have been enhanced extensively and included in this edition, that has been guest-edited by Er. P N Ojha and Er. Brijesh Singh.

Er. P N Ojha is the Joint Director and Head of the Centre for Construction Development and Research at the National Council for Cement and Building Materials (NCCBM), Ballabhgarh, Haryana, India. With over 34 years of experience in Cement and Concrete Technology, he has published more than 125 research papers and plays an active role as a member of various Bureau of Indian Standards committees and in the International Organisation for Standardisation panel of Bureau of Indian Standards for cement and concrete. He is a recipient of the Outstanding Concrete Technologist-2020 award by the Indian Concrete Institute, Gurugram Centre, and Ultratech Cement Limited.

Er. Brijesh Singh is the General Manager at the Centre for Construction Development and Research at the NCCBM Ballabhgarh, Haryana, India. His research interests include durability of concrete, high-strength, and high-performance concrete. He has published over 150 research papers and is a member of various Bureau of Indian Standards committees. He has received multiple awards, including the Outstanding Concrete Technologist-2021 and 2023, Prof. V. Ramakrishnan national Young Scientist award 2024, and the 15th Construction Industry Development Council's Vishwakarma award 2024 for scientists.

We hope you enjoy this special edition, and we look forward to your feedback.

Production Editor
Indian Concrete Journal

Dear Readers,

As guest editors of this second special edition from the best publications presented in the 18th NCB International Conference and Exhibition on Cement, Concrete and Building Materials held at IICC Dwarka, Delhi in November 2024, we are pleased to present a collection of key research papers focused on sustainable and durable construction materials. The 18th NCB International Conference and Exhibition is known as the biggest conference on cement and construction materials in India which witnessed more than 1500 participation this time by cement industry, construction industry, academia, researchers and experts from diverse fields to discuss and explore the latest advancements in the area of cement, concrete and allied building materials for construction industry. The research papers presented in this edition reflect a diverse topics in the area of corrosion behavior of reinforcing steels, alkali-activated concrete for RMC application, mineral carbonation of artificial lightweight aggregates, etc.

In the first paper, Malladi and co-authors [1] discuss the passivation and corrosion behavior of commonly used quenched self-tempered or thermos-mechanically treated bars (TMT), stainless steel (SS), and mild steel (MS) reinforcing bars in both chloride-free and chloride-contaminated simulated concrete pore solutions. Electrochemical techniques such as open circuit potential (OCP), linear polarization resistance (LPR), and cyclic polarization(CP) tests were carried out to evaluate passivation and corrosion behaviour of steel rebar specimens in chloride-free and chloride-contaminated simulated concrete environments. The SS specimens displayed a significantly lower current density (≈ 15 times) in both environments compared to TMT and MS, indicating the presence of a bi-layered structure and greater pit stability. TMT specimens recorded higher corrosion rates in both environments, indicating their relative corrosion vulnerability when compared to the other two steel rebars. Interestingly, SS rebar specimens exhibited nearly consistent data in both environments, likely due to the inner Cr-rich oxide layer having very few defects and being significantly superior to those of TMT and MS rebar specimens. Nevertheless, MS and TMT exhibited relatively higher current densities, which is due to the effect of lower capacitance. The n–type behavior was observed in TMT and MS specimens, which could be due to the inherent differences in the composition and microstructure.

The second paper by Trivedi *et al.* [2] presents experimental work focused on the development of Reinforced alkali activated concrete in a Ready Mix Concrete (RMC) plant. It evaluates the mechanical and durability properties of the mixes, along with inspection and quality assurance of a demonstration structure. RMC refers to concrete manufactured in a central batching plant and delivered to construction sites in a ready-to-use form. RMC construction offers several advantages, including quality control, time efficiency by eliminating on-site batching, reduced labour due to minimized manual mixing and handling, and less wastage. The collapsible slump is obtained at the batching plant, and after 1 hour, the slump is found to be around 150 mm

for the mix. The temperature of the alkali activator initially reached around 70°C upon mixing. The temperature regulation is crucial to optimizing mixing conditions and ensuring safe handling. The successful retention of workability over an extended period led to the successful implementation of ready mix AAC. The Load-deflection testing of the structure confirmed more than 91% recovery and compliance with IS: 456 (2000) safety criteria. The construction of demo structures with alkali-activated concrete (AAC) using RMC helps in understanding the challenges of using AAC in construction projects. This study is an important step towards AACs viability in RMC applications, advancing sustainable construction practices.

The third paper by Humaira Athar *et al.* [3] investigates the technical viability of producing artificial lightweight aggregates from municipal solid waste incinerated bottom ash (MSWIBA), municipal solid waste incinerated fly ash (MSWIFA), and cement through an autoclaving process. Before pelletization, MSWIFA underwent a washing process, resulting in a reduction of approximately 95% chloride and 75% sulphate content. This study aims to evaluate the feasibility of bulk utilization MSWIA to produce lightweight aggregates through the autoclaving process, followed by CO_2 sequestration. The aggregates are developed under different autoclaving pressures and carbonated under varying conditions. Their physico-mechanical properties, such as bulk density, water absorption, specific gravity, pH, and single pellet strength, are characterized. Toxicity characteristics, leaching procedure, and embodied energy of LWA are also discussed. The study confirms the environmental viability of utilizing Municipal Solid Waste Incineration Bottom Ash (MSWIBA) and Fly Ash (MSWIFA) in concrete production through a significant reduction in leachable heavy metal concentrations. The incorporation of these residues into concrete not only ensured compliance with USEPA regulatory limits but also demonstrated effective immobilization of the hazardous elements due to the formation of stable hydration products like C–S–H gels. These findings highlight the potential of cement-based solidification/stabilization mechanisms to enhance environmental safety while promoting the sustainable valorisation of MSWI residues in the construction industry

The fourth paper evaluates an approximate analytical solution to the fractal Richards equation for both power-law and exponential diffusivity functions. The analysis is based on water absorption profiles for seven different materials sourced from the literature, using a leave-one-out cross-validation approach. The best fits for the exponential and power-law diffusivity models were obtained for the cases of cement-lime-sand mortar and Lepine limestone, respectively. In these cases, the tested specimens do not appear to have attained capillary saturation near the exposed surface and thus do not exhibit a sharp wetting front over the duration of the water absorption test. This observation suggests the suitability of the studied model in predicting moisture distribution at the initial stages of water absorption. Results indicate that the exponential diffusivity model fits the experimental data better compared to the power diffusivity model. It is also revealed that the power law-based solution exhibits an artifact, manifesting as an unexpected increase in saturation at greater depths. For siliceous brick, which assumes a nearly rectangular sharp wetting front at later stages of water absorption, both the exponential and power-law models exhibited poor agreement. This observation indicates that the approximate analytical solution of the fractal Richards equation cannot satisfactorily describe the moisture distribution corresponding to a near-saturation condition. Moreover, the artifact observed for power-law diffusivity was observed to get even more pronounced in this case.

In the presented edition, we, the guest editors, strived to build awareness and promote sustainable as well as durable construction in India. The research presented in this issue offers promising insights into the future of sustainable construction materials and novel methods for evaluating the materials. The use of alternative materials and novel methods not only presents an accurate solution but also contributes to reducing environmental impacts and promotes the circular economy. We all together can continue to share and advance information and knowledge gathered in the realm of concrete and the construction industry. Please do continue to share the findings and application knowledge in your community groups to make a positive impact in the construction sector. It has been a privilege to present this concise summary of the latest advancements in construction materials and showcase their potential to redefine modern construction practices.

With Best Regards,

Er. P N Ojha and Er. Brijesh Singh

Guest Editors, National Council for Cement and Building Materials, Ballabgarh, India

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