

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 Saikat Sarkar.

Dr Saikat Sarkar is an Assistant Professor in the Department of Civil Engineering at Indian Institute of Technology Delhi (IIT Delhi). His research interests include fracture and failure mechanics of structures, modeling of cement-like composites and devising seismic hazard mitigation strategies. Dr Sarkar has published around 20 research articles in international journals of repute and 3 book chapters.

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

Production Editor  
Indian Concrete Journal



Dear Readers,

GGreetings! It gives me immense pleasure to bring out the June 2024 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 strength aspects of concrete, effect of moisture contact in concrete, implication of fiber addition in concrete and its influence on improving mechanical properties and preserving the performance of concrete structures is bringing in multi-dimensional challenges for researchers and practitioners. This issue of the ICJ consists of five high quality technical articles addressing the above-mentioned challenges.

In construction, certain coatings are applied to concrete surfaces to shield them from water and harmful substances. However, the effectiveness of these coatings can vary based on factors like the type of concrete used, surface moisture content, environment after construction, etc. In [1], the authors develop a new repellent material, based on stearic acid to enhance the efficiency of concrete under moist conditions. Their work demonstrates the superior hydrophobicity and resistance of the repellent against chloride ingress and carbonation when applied to blended cement concrete surfaces. The addition of fatty acids and hexanes allows application in both wet and dry conditions, with no apparent impact on chloride diffusion coefficients, even under wet conditions. The coating significantly reduces chloride penetration and carbonation rates, with higher coating amounts further improving surface characteristics.

In [2], the authors investigate the impact of jute fiber on both fresh and hardened mechanical properties of concrete, aiming to promote sustainable development through natural fiber reinforcement. Concrete specimens with different shapes, varying lengths (10 mm and 20 mm) and volumes (0%, 0.25%, 0.50%, 0.75%, and 1%) of jute fibers were tested for compressive, split tensile, and flexural strength at different ages of concrete. Results from this study indicate that 0.5% jute fiber produces similar results as compared to the control mix, while 0.25% addition enhances hardened properties. The result of a factorial analysis shows that fiber length and volume of jute fiber significantly affect the properties of hardened concrete, while slump values decrease with fiber addition. However, this issue is managed with a suitable quantity of super plasticizers. This article also includes correlations between compressive and flexural strengths, as well as

split tensile strengths, which assist in predicting concrete performance.

In [3], the authors investigate the effects of deicer solution on concrete compressive strength and its microstructure at sub-zero temperatures. Concrete specimens in the study are exposed to different deicer chemical solutions such as: sodium chloride, sodium acetate, calcium nitrate, and urea at various concentrations (3%, 6%, and 9%) and tested after 14, 28, and 90 days. Results obtained from this study show that sodium acetate contributes to the most significant decrease in compressive strength (up to 30.79% at 9% concentration), while at 3% concentration, calcium nitrate increases the strength by 17%. The changes are attributed to new product formation and microstructure alterations. These morphological changes in microstructure are observed via FE-SEM. XRD analysis confirms that calcium nitrate has a positive impact on the compressive strength of concrete.

In [4], the authors propose a hybrid control system aimed at reducing building response to earthquake ground motion. It combines shape memory alloy passive dampers with an active mass damper to achieve this objective. The system is designed to minimize response using a smaller active control force, while maintaining performance against mild to moderate earthquakes. Through theoretical and numerical analysis, the effectiveness of the hybrid system is demonstrated in reducing building frame responses to earthquake-induced excitations, as compared to an active control system.

In [5], the authors highlight the critical role of connections in Reinforced Concrete (RC) structures and the challenges posed by inadequate detailing, especially at beam-column junctions. While Fiber Reinforced Polymer (FRP) jacketing is a common solution, issues like debonding and cost have prompted exploration of alternatives. The study evaluates the use of stainless-steel wire mesh (SSWM) for strengthening these junctions. Through experimental testing, it is found that SSWM strengthened specimens show a significant improvement in their ultimate load capacity (14-15%), energy absorption, and ductility compared to control specimens.

In a nutshell, this issue of the ICJ presents research contributions covering a wide range of new developments, and applications in the domain of concrete surface repellents, fiber addition and influence of deicer solution on mechanical properties of concrete, effect of shape memory alloy damper on concrete building frame subjected to earthquake excitations and application of SSWM for strengthening

beam-column junction. 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 researchers and practicing engineers.

Best Regards,  
**Saikat Sarkar**  
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