EDITORIAL

Dear Reader,

Our August edition focused on the advances in the state of the art in elevated temperature behaviour of concrete materials and structures. Prof. Vasant Matsagar, our Guest Editor, delivers contemporary knowledge on this emerging topic in the concrete industry with this sequel edition. Prof. Matsagar, who is well-known in both academia and industry, specialises in Multi-Hazard Protective Structures, and is presently serving as Dogra Chair Professor in the Department of Civil Engineering at the Indian Institute of Technology (IIT) Delhi.

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Dear Colleagues,

Research priorities in hitherto relatively ignored area of structural fire engineering are typically categorised in elevated temperature behaviours of materials and structural systems. As the structural fire engineering directly deals with life safety, multidisciplinary stakeholders in the construction industry have crucial roles to play in developing resiliency of structures to fire exposure. Among them, structural engineers are mainly responsible for the selection of construction materials and design of structural systems for desirable adequacy of their performance under fire. The call for research contributions on the thematic topic of "Elevated Temperature Behaviour of Concrete Materials and Structures" in the Indian Concrete Journal (ICJ) has received overwhelming response. Therefore, we have divided the accepted manuscripts into two issues, one published earlier in August 2019 and herewith the second issue is being presented.

This issue has a total of six contributory manuscripts presenting original research work and one point-of-view (PoV) article. Though initially an attempt was made to keep a balance between the number of manuscripts based on materials and structural system, because of the contributions received and recommendations of the peer-reviewers, relatively larger number of published manuscripts are based on elevated temperature behaviour of construction materials than that on the structural systems. This in itself ultimately highlights the need for further investigations on elevated temperature behaviour of structural systems, which explore studying their performance, analysis and design approaches, fragility and risk assessments.

The various effects of elevated temperature on ferrochrome ash based mortars, quaternary blended bacterial self-compacting concrete (QBBSCC), perlite concrete, alkali-activated binder, fly ash and iron ore tailing based concretes are investigated by the authors and presented in the manuscripts here. Subsequently, multi-criteria optimisation of concrete mix is presented to partially replace ordinary Portland cement (OPC) with fly ash, and partially replace the natural fine aggregate by iron ore tailings. The concluding manuscript has dealt with summarising effects of elevated temperatures on high strength concrete. Though the papers included herein this issue do not necessarily represent the complete spectrum of research conducted on the subject exhaustively, it does give an idea about some ongoing studies being conducted and accomplished. These contributions will be immensely useful to the academicians and practitioners in fire safety engineering. The PoV article has focussed on material modelling of steel reinforced concrete (RC) structures exposed to elevated temperatures, providing guidelines to evaluate fire resistance of newly proposed structures and to estimate the residual strength capacity of already built structures in fire, useful to the practicing engineers and designers.

Besides, the Guest Editor takes this opportunity to deliberate on research needs revealed while editing these thematic issues. In structural fire engineering, several topics require an in-depth research that indicatively include, modelling approaches; establishing thermo-mechanical constitutive laws of the advanced construction materials employed these days; experimental investigations at small- and large-scale to correctly quantify effects of elevated temperature on (a) individual structural members and (b) structural systems; development of analysis and design philosophies that are fully validated; applying performance-based design (PBD) concepts; and evaluating fragility and risk associated under myriad of uncertain parameters. The standard temperature-time curves given in some standards does not completely characterise the realistic fire scenarios experienced in buildings, which mandates properly defining fire loading in terms of intensity and exposure duration. Furthermore, the design philosophies developed for structures in ambient conditions are not necessarily applicable at the elevated temperatures; thereby, requiring development of new analysis and design approaches for structures in fire. The behaviour of member joints, composite actions between elements of different materials, bond behaviour between reinforcement and surrounding concrete at elevated temperatures are yet to be fully comprehended. Additionally, while editing this issue, need is felt to address some clear knowledge gaps identified in consideration of the hygrothermal effects in the structural models; fully understanding mechanics of explosive spalling in high-strength concrete and its effective prevention; and structural effects caused due to varying natures of travelling fire scenarios. Hopefully, subsequent issues of the ICJ will address some of these issues requiring urgent attention in structural fire engineering.

Building regulations, especially in India, should require structural engineers to consider the effects of fire loading on the structures at design stage, and either provide an adequate level of resistance to fire hazards or evaluate probable structural performance under the considered fire exposure scenario. Especially, for hospital buildings contemporary fire-resistant design philosophies are mandatory to be adopted for maintaining desired fire rating, in order to avoid unfortunate mishaps otherwise taken place recently in different states. Nevertheless, eventually the current prescriptive codes and standards in structural fire engineering are required to adopt performance-based design philosophies. It would require significant research initiatives geared towards addressing aforementioned unresolved issues, and subsequently development of codes and standards based on sound knowledge-base.

As a Guest Editor of these Special Issues, the unconditional support received from all the contributing authors, peer-reviewers, and the ICJ team are herewith greatly appreciated.

Vasant Matsagar
Guest Editor for the Special Issue, ICJ.