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Editorial

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Editorial

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It is a privilege to write this editorial for the April 2020 issue of *Construction Materials*, which seeks to publish original research and practice papers of the highest quality on procurement, specification, application, development, performance and evaluation of materials used in construction and civil engineering. The journal is as relevant as ever and is at the forefront of dissemination of cutting-edge knowledge and is committed to publishing excellent articles. The April 2020 issue, themed on recycled construction materials, consists of five papers, ranging from durability studies in structural concrete to usage in geotechnical engineering including practical applications.

Recycling of construction materials must be assiduously promoted as we ought to move rapidly towards a circular economy which cannot be neglected any longer (Kandasami, 2019). Sustainability concerns are on the rise and many projects in developing countries are increasingly designed for longer service life – good for a healthy planet. The recently completed Motera Cricket Stadium in Ahmedabad, India, built by the construction giant Larsen & Toubro (Figures 1 and 2), is designed for an intended service life of 100 years. It can accommodate more than 110 000 spectators and is the world's largest cricket stadium. Can we construct such durable mega structures using recycled concrete aggregates (RCA)? The opening paper, by Dodds *et al*. (2020), answers this question by a well-planned meticulous research study and boldly advocates 60% replacement of RCA in concrete mixes with significantly high content of ground granulated blast-furnace slag (ggbs) – that is, 50% replacement of Portland cement. Interestingly, the authors predict a design life exceeding 120 years. Combining such high replacement levels of RCA and ggbs is great for sustainability and the lowered risk of corrosion initiation is a huge advantage. This is beyond the prescription of current British (BS) and European (EN) standards, and published research could very well be taken as guidance whilst framing technical specifications for upcoming infrastructure projects worldwide. As the authors rightly point out, for structural concretes a consistent source of RCA should be ensured by putting in place quality protocols.

The paper by Pepe *et al*. (2020) proposes the single-particle compression test as a method to characterise coarse aggregates used in the manufacture of concrete. Characterisation of coarse aggregates by means of mechanical performance was done by determining their tensile strength and fracture energy. Locally available crushed limestone and river gravel were set as the benchmark for natural aggregate in evaluation of the performance of expanded clay, RCA and recycled brick aggregates (RBA). Basically, three different coarse aggregate types from seven different sources were studied. Physical properties were correlated to the mechanical performance of aggregates. One of the findings of this study directly attributes low particle density to high water absorption – that is, porosity. High porosity is often linked to low tensile strength as the plausible cause. In the case of RCA, this in part is attributed to the adhered mortar on the surface of coarse aggregate. Overall, as expected RBA had the lowest particle density and the highest water absorption.

Like the previous paper, the paper by Khan *et al*. (2020) has studied the relationship between tensile and compressive strengths for three types of coarse aggregates: natural stone, RBA and RCA. For four different concrete mix proportions, the authors have tested cylindrical specimens in tension and compression. The authors have concluded that the existing equation in ACI 318-11 (ACI, 2011) for predicting tensile strength from compression is valid only for natural stone aggregates and not for RBA and RCA. Instead, new equations have been proposed. The main driver for this research is the high cost of good-quality natural coarse aggregate due to its limited availability. Hence, the need to exploit the potential of recycled materials available locally.

Scarcity of raw materials in Kuwait and non-availability of coarse aggregates since the ban on quarrying has prompted

Figure 1. Bird's-eye view of Motera Cricket Stadium

Figure 2. Motera Cricket Stadium

Al-Otaibi *et al.* (2020) to synthesise lightweight aggregates (LWAs). Using locally available raw materials, production of synthetic LWAs was done in a pilot-scale plant. The materials used are red and grey clays, washed aggregates and waste lube oil. The four types of LWA produced satisfy local standard specifications and met the requirements of thermal efficiency. The four LWA concrete mixes designed did well in the various tests, comparable to the performance of commercial LWA. Successful utilisation of a by-product from sand washing has vast potential to protect the environment from indiscriminate landfill.

Concern for the environment and the accumulation of construction and demolition waste has prompted Shahverdi and Haddad (2020) to explore the combined potential of gravel, RCA and RBA in floating stone columns. Limited studies exist on the use of recycled materials in end-bearing stone columns. Therefore, in such a scenario, this study is an important work looking at improving the bearing capacity of clay bed using stone columns made of recycled materials. To characterise the recycled materials, aggregate crushing and impact values were determined; in a significant departure from the rest of the papers in this issue, water absorption has not been considered. Notably, there is no significant bulging of the floating stone columns with recycled materials, and this should encourage greater use of RCA.

It must be noted that RCA described in various papers from across the world would have undergone different processing techniques. The presence of adhered mortar on the aggregate surface influences absorption of water and, hence, due diligence should be exercised in sifting test data across the papers.

I hope you enjoy reading this special themed issue.

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