

Dear Readers,

We are pleased to bring to you our tetralogy edition on Construction & Demolition (C&D) waste in Construction. This edition includes research and practice papers providing a comprehensive view of recent developments on this theme across geographies and the possibilities it holds. This edition has been guest edited by Dr. Sivakumar Kandasami and Prof. Dr.-Ing. Jiabin Li.

Dr. Sivakumar Kandasami is a trained concrete technologist with the Construction Division - Buildings & Factories IC of Larsen & Toubro (L&T). His Ph.D. work at the University of Dundee (UK) was on concrete durability and his expertise is frequently sought for mega projects designed to last an intended service life. He takes keen interest in developing robust solutions for concreting challenges at site, involves in R&D efforts within L&T, regularly reviews manuscripts for scholarly journals and is on the Technical Board of the Indian Concrete Institute (ICI). The Institution of Civil Engineers (ICE), UK awarded him the MCR PRIZE 2012 for the best paper published in the *Magazine of Concrete Research*. He is an Editorial Board Member of *Construction Materials* (ICE, UK) and *Journal of Testing and Evaluation* (ASTM, USA). He is a Fellow of the Institute of Concrete Technology (ICT), UK and the Institution of Engineers (India). Dr. Kandasami represents India in the Council of ICT and L&T in the General Council of ICI.

Prof. Dr.-Ing. Jiabin Li is a Professor of Civil Engineering with a research focus on recycling and reuse in construction at KU Leuven, Belgium. He received his Master degree in Structural Engineering in 2004 from Tongji University with an award-winning thesis on the behaviour of concrete with recycled concrete aggregates. In 2011 he obtained his Ph.D. in Civil Engineering from Leipzig University. He joined KU Leuven in 2016 and has been the head of the research group RecyCon since October 2018 and the coordinator of Research and Education Civil Engineering on Bruges Campus since August 2020. He is the holder of three industrially sponsored research Chairs at KU Leuven in smart & sustainable infrastructure, construction waste recycling and circular construction economy, respectively. Prof. Dr.-Ing. Li was a recipient of the SEMC 2010 Young Researcher Fellowship Award.

Production Editor  
Indian Concrete Journal



Dear Colleagues,

Firstly, we would like to greet all readers of the Indian Concrete Journal (ICJ) and we sincerely wish you to stay safe and healthy during the COVID-19 pandemic. Welcome to the fourth special edition of ICJ on Construction & Demolition (C&D) Waste in Construction, which is composed of invited papers by authors from India, UK, South Africa, and Belgium. Such an international spread of contributions shows the constant reinvention happening continually across the world to tackle the huge amount of C&D waste and the consequent searching for new possibilities in the valorisation of C&D waste after processing.

We sincerely thank all the authors for their kind acceptance of the invitation and hopefully this special edition can promote new research and practical implementation of building materials and products with recycled C&D waste. We are excited to introduce the contents of this issue which can hopefully drive genuine conversation between stakeholders.

The leader article by Klomps (2021) introduces the successful utilisation of sustainable concrete in the Aquatics Centre of the 2012 London Olympics to meet the sustainability objectives set by the Olympic Delivery Authority. Meeting the set sustainability targets was found to be a big challenge during the design and construction both in terms of cement replacement as well as the incorporation of recycled aggregate. The paper explains in detail how the predefined sustainability targets were reached by adopting various strategies, which included the incorporation of recycled aggregates and recycled water, the substitution of cement with supplementary

cementitious materials (SCM), sustainable transport of materials and so on, leading to maximising the sustainability of the concrete by achieving over 4,000 tonnes of embodied CO<sub>2</sub> savings and substitution of over 29,000 tonnes of primary aggregate.

The paper by Amadi, Alexander and Beushausen (2021) provides a critical review of sustainability of aggregates for cement-based materials. In their paper, the growing demand for natural aggregates in concrete, especially sand and coarse aggregate, and their global environmental and socio-economic effects are highlighted. Different factors driving future aggregate demand, such as transport and power infrastructure, land reclamation, and housing projects are examined. The paper also gives a very good examination of the effect of the urbanisation, population growth, and economic growth on aggregate consumption in different regions of the world. Finally, it is concluded that the use of recycled aggregates, crushed sand, and slag aggregates are important sustainable alternatives to natural sand and coarse aggregates for concrete in the future.

Recycled concrete aggregates (RCA) derived from crushing old concrete have been proven to be a viable material for producing structural concrete and even high strength high performance concrete (e.g. Xiao *et al.* 2005; Xiao *et al.* 2006; Sierens and Li, 2018). Can this material be used to produce even higher-grade materials? The paper of Sierens, Joseph and Li (2021) provides a feasibility study on using coarse RCA to produce ultra high performance concrete (UHPC). The laboratory test results indicate that it is possible to manufacture UHPC with RCA through a proper selection of the constituents and mix design. The developed UHPC with RCA achieved record high compressive strengths, up to 160 MPa. This research work significantly explored the use of RCA further up the value chain.

The paper by Biswal and Dinakar (2021) presents an interesting study on the use of coarse RCA to fully substitute coarse natural aggregates in developing self-compacting concrete (SCC). The all-in aggregate grading curves in the DIN standard were employed. To further improve sustainability of the SCC mix, different SCMs were also used. Both the fresh properties and the compressive strength of the developed SCC mixes at different curing ages were measured. The test results indicate that the DIN all-in aggregate grading provides better workability and mechanical properties in

comparison to BIS all-in aggregate grading method, especially when SCMs are included.

A second research dealing with SCC mixes using recycled materials in this special issue is provided in the paper of Ajay, Joshi, Girish and Bharadwaj (2021). The authors reported a comprehensive laboratory work on manufacturing M30 grade SCC using IS: 10262. A total of five different SCC mixes were produced by utilizing fly-ash and Ground Granulated Blast Slag (GGBS) as filler materials along with natural river sand, marble dust, fly-ash, dried ready-mix concrete sludge, and granite sludge as fine materials. The used coarse aggregate has a maximum size of 20 mm. The fresh properties, microstructure and compressive strength of the developed SCC mixes were investigated. The test results reveal that the developed SCC mixes exhibited satisfactory performance. In addition, the SCC mixes with fine materials such as granite sludge showed better performance compared to other fines.

Many previous studies have shown the utilisation of recycled aggregates (RA) from C&D waste in producing both non-structural and structural materials and products is technically feasible and economically viable. However, whether the use of RA can really lead to environmental benefits and improve sustainability is still frequently questioned due to its inherent complexity. This closing paper of this special issue, contributed by Thomas, Sankaran, Jisha and Dhanya (2021), provides an attempt to assess the sustainability

of M25 grade concrete incorporating coarse RA at different replacement percentages to natural aggregates, following a cradle-to-gate life cycle assessment approach. In their work, the mix design parameters of the concrete were suitably modified with the increase in replacement percentages of RA to achieve the strength requirement. The assessment of the environment impact was carried out by means of the CML 2001 baseline method. The authors have pointed out that the environmental burden with concrete could be reduced in case of an optimum usage of coarse RA.

As Guest Editors sitting in different parts of the world, we could virtually meet and co-ordinate with the Production Editor to bring out this special issue amidst the raging pandemic. Once again, we thank all the contributors and the reviewers for their equally valuable support in enhancing quality of the papers.

We would like to recommend reading all the papers to our readers and believe that the content is very useful, not only for further research but also for practice.

Enjoy your reading!

Regards,

Sivakumar Kandasami

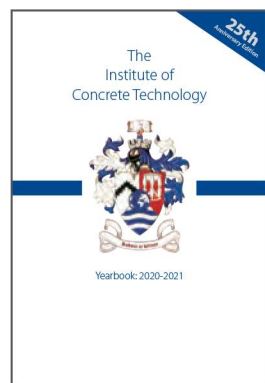
Jiabin Li

Guest Editors for the Special Issue, ICJ

## REFERENCES

- Klomps, S. (2021). "The use of sustainable concrete in the London Aquatics Centre", *The Indian Concrete Journal*, Vol. 95, No. 5, pp. 7-11.
- Amadi, I., Alexander, M.G. & Beushausen, H. (2021). "The future of concrete aggregates - A brief review", *The Indian Concrete Journal*, Vol. 95, No. 5, pp. 12-21.
- Xiao, J., Li, J., & Zhang, Ch. (2005). "Mechanical properties of recycled aggregate concrete under uniaxial loading", *Cement and Concrete Research*, Vol. 35, No. 6, pp.1187-1194.
- Xiao, J., Li, J., Zhang, C. (2006). "On relationships between the mechanical properties of recycled aggregate concrete - An overview", *Materials and Structures*, Vol.39, No. 6, pp. 655-664.
- Sierens, Z. and Li, J. (2018). "Mechanical properties of concrete with recycled aggregate at early ages", *ACI Special Publication*, Vol. 326, pp. 39.1-39.10.
- Sierens, Z., Joseph, M. & Li, J. (2021). "Feasibility of using recycled concrete aggregates to produce ultra high performance concrete: A preliminary study", *The Indian Concrete Journal*, Vol. 95, No. 5, pp. 22-29.
- Biswal, U. S. and Dinakar, P. (2021). "Effect of aggregate grading on the fresh and mechanical performance of recycled aggregate self-compacting concrete", *The Indian Concrete Journal*, Vol. 95, No. 5, pp. 30-40.
- Ajay, N., Joshi, A.M., Girish, S. & Bharadwaj, N. (2021). "An experimental study in developing self-compacting concrete as per IS: 10262 (2019) by utilising the marginal materials as fines", *The Indian Concrete Journal*, Vol. 95, No. 5, pp. 41-50.
- Thomas, T. S., Sankaran, V., Jisha, K. V. & Dhanya, B. S. (2021). "Sustainability assessment of M25 grade recycled aggregate concrete", *The Indian Concrete Journal*, Vol. 95, No. 5, pp. 51-62.

## BOOK REVIEW



The latest edition of the ICT Yearbook is now out – a 'silver' edition to celebrate 25 years of publication. And it is bumper edition, with new features and additional content. A foreword by Prof. Peter Hewlett, the long-standing chairman of the editorial panel, reviews the Yearbook's growth over the period since 1996, and two articles introduce the ICT's most recent developments: the Institute's webinar programme and the new partnership with RILEM. The core content consists of eight technical papers presented at the annual ICT Convention, commencing with a keynote paper by Prof. Phil Purnell, 'Between a rock and a hard place', but is extended by several commissioned papers from members of the Institute. These papers address such subjects as superabsorbent polymers, the water ponding curing method and carbon neutrality for concrete. A short piece on site acceptance of concrete entitled 'What not to do' distils members' experience of poor practice, to illustrate the value of training and qualification. Regular features are retained, with Prof. Rod Jones the subject of this year's 'face-to-face' interview, and John Lay describing the work of the Examinations Committee. Historical topics are treated with Wilhelm Michaelis (1840-1911) this year's 'Pioneer of concrete technology' and the GPO Building this year's 'Significant concrete structure'. A guest piece by the World Cement Association's chief executive considers 'The global cement industry and technology: past present and future'. As usual the Yearbook concludes with abstracts

of the latest dissertations and project reports to have been awarded the Diploma or MSc in Advanced Concrete Technology. Copies are available for purchase from [ict@concrete.org.uk](mailto:ict@concrete.org.uk)