Editorial

Wei-Liang Jin*

College of Civil Engineering and Architecture,
Zhejiang University,
A605 Anzhong Building, 388 Yuhangtang Road,
Hangzhou 310058, China
E-mail: jinwl@zju.edu.cn
*Corresponding author

Hiroshi Yokota

Division of Engineering and Policy for Sustainable Environment,
Faculty of Engineering,
Hokkaido University,
Kita 13, Nishi 8, Kita-ku, Sapporo, Hokkaido 060-8628, Japan
Fax: +81-11-706-6204
E-mail: yokota@eng.hokudai.ac.jp

Biographical notes: Wei-Liang Jin is a Professor of Structural Engineering at Zhejiang University where he served as Head of Institute of Structural Engineering and Deputy Dean of College of Civil Engineering and Architecture. He commenced his academic career at the Zhejiang University, where he rose to the rank of Professor in Structural Engineering in 1996. Author of more than 200 research papers, he continues active structural research and is on the board of several academic journals. He is also a member of editorial committee of several national structural technological standards.

Hiroshi Yokota is a Professor of Faculty of Engineering at Hokkaido University. He obtained his Doctor of Engineering from Tokyo Institute of Technology in 1993. Before joining Hokkaido University in 2009, he had served as a Distinguished Researcher of Port and Airport Research Institute, Yokosuka, Japan. His research interests are lifetime engineering of civil infrastructure including assessment and prediction of structural performance, service life design, life-cycle cost estimation, and life-cycle management.

This special issue on durability of concrete structures contains 11 technical papers.

The paper by Dang Giang Hoang and Shin-ichi Igarashi entitled 'Determination of water-cement ratios of hardened cement pastes based on the estimation of under-pixel porosity in backscattered electron images' opens this special issue of the journal. A method to determine water-cement ratio of hardened cement pastes is proposed in this paper based on simple image operations for BSE images. The result indicates that the shift in the grey level histogram is of use for microstructure in cement paste.

'Service life design of concrete structures: the limit state and reliability-based approach given in *fib* MC SLD and ISO 16204' is introduced by Steinar Helland. The author describes an initiative to establish a methodology for the service life design in a more analytical and transparent way when designing a new structure or when

assessing an existing structure's remaining service life. The methodology is based on a probability-based limit state approach.

In 'An approach for measurement of chloride threshold values', Dimitrios Boubitsas and Luping Tang describe the development of a practice-related approach including specimen shape, preconditioning, corrosion measurement techniques, and calculation concepts for determining the critical chloride content to initiate corrosion of steel reinforcement. The evaluation and further improvements on the presented approach are discussed in this paper.

Experimental investigation has been conducted by Indrajit Ray, Dayong Fan, Julio F. Davalos and Arkamitra Kar in their paper 'Durability evaluations of bridge deck high-performance concrete' to investigate the durability of high performance concrete with different combinations of fly ash, slag, and silica fume. The durability is evaluated with the results of rapid chloride penetration, chloride diffusion, combined freezing-thawing/salt-scaling, and physical sulphate attack tests. The discussions are made on future optimisation of high performance concrete.

Jong-Pil Won, Chan-Gi Park, Su-Jin Lee and Byung-Tak Hong experimentally discuss the durability of hybrid FRP rebar in marine environments in their paper 'Durability of hybrid FRP reinforcing bars in concrete structures exposed to marine environments'. Laboratory-simulated marine environment tests confirm that high residual strength is obtained in all the test cases and desirable resistance of hybrid FRP rebar to marine environment is achieved.

Experimental investigations were conducted by Yuichiro Kawabata, Ema Kato and Mitsuyasu Iwanami in their paper 'Structural performance evaluation of heavily deteriorated RC members based on simplified inspection results'. They discuss structural performance of heavily deteriorated reinforced concrete members based on simplified inspection. The accuracy of evaluation with the simplified inspection is quantified for practical applications.

Luping Tang and Anders Lindvall discuss the validation of models for prediction of chloride ingress in concrete in de-icing salt road environment in 'Validation of models for prediction of chloride ingress in concrete exposed in de-icing salt road environment'. The models include the simple ERFC model, the DuraCrete model and the ClinConc model. The sensitivity of input parameters in each model is analysed and the age factor is concluded to be the most sensitive one.

A method for chloride profiling along the interface was developed by Nelson Silva, Luping Tang, Jan Erik Lindqvist and Dimitrios Boubitsas in their paper 'Chloride profiles along the concrete-steel interface'. They employ SEM-EDS and XRD techniques for semi-quantitative analysis, microstructure characterisation of the pitting positions and distribution and composition of the corrosion products. The results indicate that along the interface a range of chloride levels can be expected and the interface defects are strongly influenced the pitting corrosion.

Time-dependent seismic reliability of reinforced concrete buildings located in a corrosive environment with high seismic hazard is evaluated by Chien-Kuo Chiu and Wen-Yu Jean in their paper 'Seismic reliability analysis of reinforced concrete framed buildings deteriorated by chloride ingress'. Several models have been developed to investigate the deterioration induced by chloride ingress. They develop the hazard curve of the story shear demand for each floor obtained from the seismic hazard analysis.

Ki Yong Ann, Do Gyeum Kim and Ho Jae Lee experimentally discuss the electrochemical treatment to increase the resistance against chloride-induced corrosion of steel in concrete in their paper 'Effect of electrochemical treatment at fresh condition in enhancing the corrosion resistance in concrete'. The results indicate that the electrochemical treatment increased the corrosion-free life by enhancing the resistance to corrosion, resulting from the formation of precipitated calcium hydroxide at the steel-concrete interface.

The life-cycle management of concrete structures is comprehensively presented by Hiroshi Yokota and Katsufumi Hashimoto in their paper 'Life-cycle management of concrete structures'. To ensure the performance requirements of concrete structures the authors emphasise the importance of the management linking the durability design with maintenance work. They propose the concepts of life-cycle management for formulating and subsequently modifying the life-cycle scenario regarding structural performance assurance in relation to the initial durability design.