

Preface

In designing civil engineering systems, the system performance must be considered as time-dependent. Therefore, a consistent design approach should comply with the desired performance not only at the initial stage when the system is supposed to be in the intact state, but also during its expected life-cycle. This can be achieved by taking into account the effects induced by unavoidable sources of damage and by eventual maintenance interventions under uncertainty. At present design for durability with respect to chemical-physical damage phenomena is based on simplified criteria associated with prescribed environmental conditions. As an example, for concrete structures such criteria introduce threshold values for concrete cover, water-cement ratio, amount and type of cement, and others, to limit the effects of structural damage induced by carbonation of concrete and corrosion of reinforcement. However, a durable design cannot be based only on such indirect evaluations of the effects of damage, but also needs to take into account the global effects of the local damage phenomena on the overall system performance.

In recent years a considerable amount of research work has been done, and relevant advances have been accomplished in the fields of modeling, analysis, design, monitoring, maintenance and rehabilitation of deteriorating civil engineering systems. Nowadays these developments are perceived to be at the heart of civil engineering, which is currently undergoing a transition towards a life-cycle oriented design philosophy. For this reason, after a series of International Workshops on Life-Cycle Cost Analysis and Design of Civil Infrastructure Systems held in Honolulu, Hawaii, USA (LCC1, August 7–8, 2000), Ube, Yamaguchi, Japan (LCC2, September 27–29, 2001), Lausanne, Switzerland (LCC3, March 24–26, 2003), Cocoa Beach, Florida, USA (LCC4, May 8–11, 2005), and Seoul, Korea (LCC5, October 16–18, 2006), it was decided to create the International Association for Life-Cycle Civil Engineering (IALCCE, <http://www.ialcce.org>).

IALCCE was founded in October 2006 during the 5th International Workshop on Life-Cycle Cost Analysis and Design of Civil Infrastructure Systems (LCC5). This Association covers all aspects of life-cycle assessment, design, maintenance, rehabilitation and monitoring of civil engineering systems. The mission of the Association is to become the premier international organization for the advancement of the state-of-the-art in the field of life-cycle civil engineering. The objective of the Association is to promote international cooperation in the field of life-cycle civil engineering for the purpose of enhancing the welfare of society.

IALCCE has created fertile grounds for the stimulation and promotion of research in the field of life-cycle civil engineering. It was therefore decided to bring together the main advances in the field of life-cycle engineering and related topics at the First International Symposium on Life-Cycle Civil Engineering (IALCCE'08), held in Villa Monastero, Varenna, Lake Como, Italy, 10–14 June, 2008. This Symposium has been organized on behalf of IALCCE under the auspices of Politecnico di Milano. The interest of the international civil engineering community in the activities covered by IALCCE has been confirmed by the significant response to the IALCCE'08 call for papers. In fact, more than 200 abstracts were received by the Symposium Secretariat, and about 70% of them were selected for final publication as full papers and presentation at the Symposium.

IALCCE'08 covers all major aspects of life-cycle civil engineering and related topics. They include: life-cycle damage processes (aging of structures, deterioration modeling, durable materials, earthquake and accidental loadings, fatigue and damage, fire and high temperatures, marine and severe environments, structure-environment interaction); life-cycle assessment and design (design for durability, failure analysis and risk prevention, lifetime structural optimization, long-term performance analysis, performance based design, service life prediction, time-variant reliability, uncertainty modeling); life-cycle monitoring, maintenance and rehabilitation (damage identification, field testing, health monitoring, inspection and evaluation, maintenance strategies, rehabilitation techniques, strengthening and repair, structural integrity); life-cycle performance of special structures (bridges and viaducts, high-rise buildings, hydraulic structures, offshore structures, precast systems, roof systems and hangars, runway and highway pavements, tunnels and underground structures); life-cycle cost of structures and infrastructures (decision making processes, human factors in life-cycle engineering, life-cycle cost models, project management, risk-lifetime analysis and optimization, whole life costing); and life-cycle

oriented computational tools (artificial intelligence methods, evolutionary procedures, heuristic techniques, mathematical optimization, soft-computing methods, survival models and simulation).

Life-Cycle Civil Engineering collects papers on theories, methods, algorithms, and applications in the field of life-cycle civil engineering presented at IALCCE'08. It consists of a book and a CD-ROM containing 150 papers, including eight keynote papers and 142 technical contributions from 28 countries. These papers deal with the state of the art as well as emerging concepts and innovative applications related to all major aspects of life-cycle civil engineering and related topics. The Editors hope that these Proceedings will serve as a valuable reference to all concerned with life-cycle performance of civil engineering systems, including students, researchers, and engineers from all sections of civil engineering.

Fabio Biondini and Dan M. Frangopol
Chairs, IALCCE'08
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