GUEST EDITORIAL

Design, assessment, monitoring and maintenance of bridges and infrastructure networks

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Bridges and infrastructure systems, due to their inherent vulnerability, are at risk from ageing, fatigue and deterioration processes due to aggressive chemical attacks and other physical damage mechanisms. The detrimental effects of these phenomena can lead over time to unsatisfactory structural performance under service loadings or accidental actions and extreme events. The current condition ratings of stocks of existing bridges and infrastructure networks indicate that the economic impact of structural deterioration is exception-ally high and emphasise the importance of maintenance and repair of structurally deficient bridges. To deal with these problems, bridge design criteria and methods need to be revised to account for a proper modelling of the structural system over the bridge life-cycle by taking the effects of deterioration processes, time-variant loadings, maintenance actions and repair interventions into account.

Relevant advances have been accomplished by the scientific community and engineering profession in the design, assessment, monitoring, maintenance and management of sustainable and resilient bridge structures and infrastructures. These advances have been presented and discussed at *The Sixth International Conference on Bridge Maintenance, Safety And Management* (IABMAS 2012), held in Stresa, Italy, from 8 to 11 July 2012 (http://www.iabmas2012.org). The First (IABMAS'02), Second (IABMAS'04), Third (IABMAS'06), Fourth (IABMAS'08) and Fifth (IABMAS 2010) International Conferences on Bridge Maintenance, Safety and Management were held in Barcelona, Spain, 14–17 July 2002, Kyoto, Japan, 18–22 October 2004, Porto, Portugal, 16–19 July 2006, Seoul, Korea, 13–17 July 2008 and Philadelphia, PA, USA, 11–15 July 2010, respectively.

IABMAS 2012 has been organised on behalf of the *International Association for Bridge Maintenance And Safety* (IABMAS) under the auspices of Politecnico di Milano. The objective of IABMAS is to promote international cooperation in the fields of bridge maintenance, safety, management, life-cycle performance and cost for the purpose of enhancing the welfare of society (http://www.iabmas.org). The interest of the international bridge engineering community in the fields covered by IABMAS has been confirmed by the significant response to the IABMAS 2012 call for papers. In fact, over 800 abstracts from about 50 countries were received by the Conference Secretariat, and approximately 70% of them were selected for final publication as technical papers and presentation at the Conference within mini-symposia, special sessions and general sessions, for a total of 555 papers scheduled at IABMAS 2012.

The extended versions of several selected papers presented at IABMAS 2012 and invited papers are published in this special issue of *Structure and Infrastructure Engineering*. These papers provide significant contributions to the process of making more rational decisions in bridge design, assessment, monitoring and maintenance. The paper by Modena et al. presents typical deficiencies and retrofitting strategies of existing reinforced concrete and masonry arch bridges in seismic areas. Tang gives an overview of design concepts and technical issues of modern and ancient arch bridges, with focus on aesthetics, structural shapes and construction materials. Sause presents experimental and numerical results for I-shaped tubular flange girder bridges and shows the advantages of this structural system in comparison with conventional I-girder bridges. Zhu and Frangopol investigate the effects of post-failure material behaviour on redundancy factors for design of structural components in nondeterministic systems, with emphasis on steel highway bridges. Malerba and Comaita present the aeronautical and railway specifications, the design criteria and the construction process of two integral concrete bridges for the runway of Milan Malpensa Airport in Italy. Godart discusses the main pathologies, repair activities and management of old prestressed beam and slab concrete bridges. Biondini and Vergani propose the formulation of a three-dimensional deteriorating beam finite element for damage modelling and nonlinear analysis of concrete structures under corrosion, with application to a reinforced concrete arch bridge. Diana et al. present an overview of wind tunnel activities and methodologies to support the design of long span suspension bridges considering aerodynamic phenomena. Brownjohn et al. describe a range of measurement technologies and applications in structural identification and performance diagnosis of suspension bridges. Arangio and Bontempi investigate the identification of damage and

structural health monitoring of a cable-stayed bridge based on Bayesian neural networks. Finally, Shinozuka et al. propose a remote monitoring system for a wide range of structural health-monitoring applications, from single structures to large-scale infrastructure networks.

The guest editors would like to thank the authors and the reviewers for their contributions to this special issue and hope that this collection of papers will represent a valuable reference for scientific research and engineering applications in the fields of design, assessment, monitoring and maintenance of bridges and infrastructure networks.