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Editorial

Special Issue: "Assessment and Rehabilitation of Existing Reinforced Concrete Structures and Infrastructures: Methods, Techniques and New Frontiers" †

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1. Introduction

In the last several decades, assessment and rehabilitation of the existing built environment constitute two of the major challenges for engineers, practitioners, and code-makers all over the world.

The aging, the deterioration processes, the lack of or improper maintenance, and the increasing occurrence of extreme events due to climate change have led to the need for more efficient methods for the safety assessment and retrofitting/rehabilitation of existing reinforced concrete (RC) structures. Research focused on developing new approaches suitable for the assessment of existing structures is ongoing, also with reference to the drafting of next-generation of design codes [1–4]. In one hand, these approaches deriving from research should be able to provide solutions able to reduce and/or to avoid the necessity of interventions and methods for assessing the safety conditions of built structures and service performances on aged infrastructures, always respectful of economic constraints. On the other hand, when interventions are needed, the research should provide both the tools to determine the priority of the intervention and the techniques available to reduce costs and environmental impact.

2. Advances for the Assessment of Existing RC Structures

In light of the above, the present Special Issue was introduced to collect the latest research on topics relevant to this field and, more importantly, to address present ongoing research related to the assessment and rehabilitation of existing reinforced concrete structures and infrastructures. Nine original papers from authors coming from several countries have been submitted and accepted for publication to this Special Issue after the peer-review process. Several topics have been addressed, mainly on concrete technology, life cycle assessment, structural monitoring, degradation, and fiber-reinforced concrete.

The first paper [5], which is authored by Vereecken E., Botte W., Lombaert G., and Caspeele R., proposes an application the Value of Information (VoI) method to the estimation of the benefit that can be gained from a monitoring system before it is actually implemented on an existing bridge or infrastructure. This investigation is of relevance due to the progressive adoption of monitoring systems for bridges and infrastructure management by authorities all over the world, and it proposes a straightforward approach and suggestions for the selection of the most efficient monitoring strategy. The second paper [6] is authored by Kraľovanec J., Bahleda F., Prokop J., Moravčík M., and Neslušan M. and illustrates the results applying an indirect method to determine the value of the prestressing force in prestressed concrete sleepers using a set of experimental tests. In particular, the evaluation of the actual prestressing in prestressed concrete structures is crucial for the estimation of serviceability behavior as well as the remaining service life.

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The third paper [7] relates to an experimental study on the effect of sustained loading and different service temperatures (steady and cyclic) of Near-Surface Mounted (NSM), Carbon-Fibre-Reinforced Polymer (CFRP)-concrete bonded joints and their post-sustained loading load–slip behavior. The paper is authored by Gómez J., Barris C., Baena M., Perera R., and Torres L. and reports results useful for strengthening interventions on concrete structures.

The fourth paper [8] is proposed by the authors Syll A., Shimokobe, H., and Kanakubo, T. and relates to the degradation in bond strength due to reinforcement corrosion. The analysis is carried out by performing pull-out tests on concrete specimens having induced crack width and variable stirrups ratios as principal parameters for the investigation. In fact, the reinforcement corrosion is recognized as one of the first issues in the degrading bond between steel and concrete in RC members, with related issues for durability and structural resistance.

The fifth and the sixth papers [9,10] are authored by Cleven S., Raupach M., and Matschei, T. The authors propose a new method to characterize the steel-fiber content in existing structures realized with steel-fiber-reinforced concrete. In particular, the first paper deals with the definition and validation of the method, while the second one is focused on experimental tests and related numerical modelling.

The seventh paper reported in this Special Issue is authored by Mathern A. and Magnusson J. [11], and it relates to the analysis and critical review of data collected during the production, inspection, diagnosis, and repair activities conducted in the construction of the foundations for a wind farm project in Sweden. The eighth paper [12], authored by Pleșcan C., Barta M., Maxineasa S., and Pleșcan E., presents a life cycle assessment (LCA) for the rehabilitation of a national road sector in Romania with reference to crucial ecological issues.

Finally, the paper [13] authored by Rutkowska G., Ogrodnik P., Żółtowski M., Powęzka A., Kucharski M. and Krejsa M. discuss the possibility of using fly ash from the thermal treatment of sewage sludge as an alternative additive to concretes resistant to environmental influences occurring in communication tunnels.

In conclusion, and as a final remark, the challenges in the coming decades for engineers and practitioners will be the assessment, monitoring and rehabilitation of the existing built environment. Many existing RC structures and infrastructures were built more than 60 years ago and requires accurate evaluations in order to decide if interventions are necessary or if it is preferable to demolish them and rebuild. These decisions will have a significant impact on society, especially with the goal in mind to limit the effects of climate change.

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