

Monitoring of timber structures

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1 Foreword

Timber structures have been in use for centuries, with proven durability. In recent years, timber has become particularly important, due to its standing as a truly renewable material for construction and carbon storage purposes. The material behaviour of wood is known and understood. The current design concepts for timber structures are also well developed. Nevertheless, the underlying processes of the ageing and deterioration of wood are complex, and the anisotropic structure of wood requires close consideration of its orthotropic material behaviour. This implies that there are a variety of environmental and material parameters that influence the ageing and deterioration of timber. Monitoring is an important tool which can assure the durability of timber structures and optimization of maintenance.

This special issue of the Journal of Civil Structural Health Monitoring gives a review of the activities within the field of monitoring of timber structures, predominately from a European perspective. It is compiled by members of Working Group 3 (WG 3) of the European Cooperation in Science and Technology (COST) Action FP 1101 where several activities related to timber structures are clustered. The COST Action FP 1101 consists of three working groups pertaining to Assessment (Working Group 1), Reinforcement (Working Group 2), and Monitoring (Working Group 3), of Timber Structures. The objective of the Action is to increase the acceptance of timber in the design of new structures and in the repair of old buildings by developing and disseminating methods to assess,

reinforce, and monitor them. The need for assessment, reinforcement, and monitoring of timber structures arises from multiple motivations, such as the expiration of the planned lifetime, material ageing, exceptional incidents, and ever more important; a change in use.

Regarding monitoring of timber structures, no state of the art currently exists. In other areas (e.g. climate science, seismology, conservation of art and cultural heritage, aerospace, etc.), monitoring capabilities are already a standard practice. Partially monitoring is already included in current design concepts. Therefore, WG 3 represents a multidisciplinary approach considering expert knowledge from timber engineering, material science, non-destructive testing, sensor development, and monitoring. The contributions to this special issue on monitoring of timber structures represent a compilation of papers regarding monitoring concepts, the physical properties of wood, sensor concepts, and case studies related to monitoring of timber structures. This collection provides an overview of the actual developments towards a state of the art for monitoring of timber structures. The principal questions related to monitoring of timber structures are of international relevance.

As guest editor, I believe that this special issue addresses topics which are of interest to experts from a variety of disciplines. This collection of contributions has been compiled with an emphasis on the European perspective. However, it is my hope that this initiative will trigger further activity at an international level. Renewable construction materials are amongst the potential solutions towards the challenges for today's global society. I hope this special issue will lead to a variety of new concepts and ideas within this domain.

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