Preface on special issue: Lightweight Innovative Ice Structures

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This special issue on ice structures contains a broad variety of papers related to innovative development concerning ice and ice composites. Most of the authors are affiliated with departments of built environment and connected to the International Association for Shell and Spatial Structures and International Journal of Space structures. The construction industry creates and maintains a built environment that emits about half of all carbon emissions. Recent success in reducing operational energy and the introduction of strict targets for near-zero energy buildings mean that embodied energy will soon become a dominant part of whole-life energy consumption. The importance of this shift in focus is compounded by the analysis of recently constructed buildings which demonstrates that material wastage in the order of 50% is commonplace. Lightweighting, and the minimisation of wholelife embodied energy, requires new research that crosses effectively between digital design and physical realisation. The use of ice might help close this gap between idea and reality. We envisage the automated design and manufacture of building components with ice molding and use of ice for stabilisation

of soil for civil engineering as well as the use of ice for expositions. Ice is a fully circular material with almost no carbon emissions. The papers in this special issue push the use of ice beyond the status quo and synthesizes across disciplines. After a rigorous selection and invitation process, along with full peer review, we are pleased to present here a collection of 7 papers from different part of the world, from Canada to Finland, Sweden and China . The issue covers a wealth of exciting topics, joined by a common thread of digital design linked to physical construction. Realised projects range in scale from benchtop proof of concept to full-size buildings. The papers here present new concepts in how we might do more with ice as a material. We thank the authors of the papers in this special issue for their extremely diligent work during the revision process and thank all the reviewers for their constructive criticisms and suggestions on the papers. We hope you enjoy reading this special issue.

Best regards,
Professor Arno Pronk TU Eindhoven, Netherlands