OPTIMISATION IN FOOTBRIDGE DESIGN

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Summary

This paper explores the interim findings of research and development, jointly undertaken by BKK Architects in collaboration with the Innovative Structures Group at RMIT University, into the application of Bi-directional Evolutionary Structural Optimisation in footbridge design. The research to date has revealed valuable insights about the way in which new technologies transform not only processes and methods, but also relationships

Keywords: BESO, trans-disciplinary, finite element analysis, evolutionary technique, resource efficiency, biomimicry, process, algorithmic, materials, topology.

1. Introduction

Over the last decade BKK Architects has developed a collaborative approach to research and design that has extended the firm's knowledge and networks beyond the domain typically occupied by architectural practice, drawing on the expertise of partners in diverse fields ranging from mathematics, sculpture, materials science, manufacturing, and engineering analysis.

The practice's portfolio of footbridge designs, encompassing both commissioned work and internally funded research, illustrates the rich design opportunities afforded by a transdisciplinary perspective. BKK's collaboration with the Innovative Structures Group (ISG) at RMIT University highlights the importance of key relationships critical to innovation in footbridge design; the relationship between the academy and industry, research and development, design and production, theory and practice.

The partnership between BKK and ISG has focused on the application of BESO techniques (Bi-Directional Evolutionary Structural Optimization) to footbridge design and construction, a method of engineering analysis and design pioneered by ISG's Professor Mike Xie. This collaboration began with a commissioned project for a footbridge replacement program along a major metropolitan freeway. While the project was cut short, the design concepts evolved under their own momentum into a joint research project. This paper explores the broader issues of transdisciplinary collaboration in footbridge design though the lens of our BESO footbridge experience.

2. Collaboration

BKK Architects was founded on a philosophy of collaborative design which, in the early phase of the practice, was typically enacted through informal partnerships with external agencies and experts. In 2005 the practice was given the opportunity to engage in a more structured collaboration with RMIT University when it was invited to participate as a Practice Partner in an embedded research PhD program. The program, facilitated by the university's Spatial Information Architecture Laboratory (SIAL), involved the deployment of architectural doctoral candidates into practices to undertake applied research in parametric design. As a result of the program, BKK established in-house research and development capabilities focusing initially on associative geometry.