

Reinventing the truss: A collaborative pedestrian bridge design project

Christiane M. HERR, Wenyu HOU*, Shuqi LI, Haoning ZHANG, Davide LOMBARDI

*Xi'an Jiaotong-Liverpool University
111 Ren'ai Road, Suzhou Industrial Park, Jiangsu, PR China
Wenyu.Hou16@student.xjtlu.edu.cn

Abstract

The increasing specialization of the professions of the structural engineer and the architect over the past decades has progressed alongside a differentiation of professional tools, workflows and values. Yet, collaborative design work remains a key aspect in projects that address not only technical efficiency but also human experience. Cross-disciplinary collaboration requires not only consciousness of professional values motivating contributions from either structural engineering or architecture, but also a language that allows exchanges across disciplinary boundaries. Without these, an engineer's focus on safety may be misunderstood as narrow-mindedness and an architect's focus on conceptual coherence may be misunderstood as ignorance [1]. This paper discusses the design process of a short-span pedestrian bridge among a team of architecture students, with consultant advice from civil engineering students as well as from external structural engineering practitioners. The account reflects the experience of the design team members involved in the design process.

Based on the structural type of the truss, the bridge is developed through an explicit negotiation of architectural and engineering considerations. This process is documented to illustrate the range of considerations required in the design team, and to provide a differentiated counterpoint to stereotypes of disciplinary contributions to cross-disciplinary designing, identifying how key values are negotiated to guide the design process [2]. The bridge project illustrates a workflow driven by the analysis of case studies as well as the reinterpretation of standard structural types, where ideals of structural engineering art are complemented with architectural design values. Resulting bridge proposals are critically reviewed in detail, showing how structural minimalism does not always provide the most preferable overall solution.

The concluding part of the paper discusses the educational background of the design project in relation to previous work in the field which has recommended teaching a cross-over of skills such as case study research, sketching for idea development and simplified structural assessment [3]. In establishing cross-disciplinary design practice, the project sets an example for its context (China), where architecture and structural engineering still have little to no interaction during the design process.

References

- [1] C. Olsen and S. MacNamara, *Collaborations*, Routledge, 2014.
- [2] E. Hines, "Understanding Creativity," in E. Hines, S. Buonopane, M. Garlock and D. Billington (eds.), *Festschrift Billington 2012: Essays in Honor of David P. Billington*, International Network for Structural Art, 2012.
- [3] P. Gauvreau, "Sustainable education for bridge engineers," *Journal of Traffic and Transportation Engineering* (English Edition), vol. 5 no. 6, pp. 510-519, 2018.