

Collaborative Design between Architecture and Structure: A Review of Composite Ice Shell Design and Construction in 2018 Harbin Ice & Snow World

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Abstract

In the winter of 2018, the teachers and students from the School of Architecture and the School of Civil Engineering, Harbin Institute of Technology, jointly designed and guided the construction project of the Ice Hotel and Ice Bar in the Harbin Ice-Snow World Park. Covering a total construction area of 630 square meters, with a building height of 7.5 meters and its maximum span reaching 26 meters, the project, designed and built in China, is the first practical project adopting composite ice shell technology and open to the public. The construction of the project started on December 21, 2018. The ice shell was completed on December 31, 2018, and on the same day the pneumatic membrane mould was removed successfully. On January 5, 2019, the construction project was accomplished and officially put into use. Through adequate daily maintenance, the ice shell's using life can reach 50 days and will be closed on February 24, 2019.

This paper reviews the design and construction process of the Composite Ice Shell Project in Harbin Ice-Snow World Park. Starting from investors' requirements for the project, site environment, construction schedule and construction cost, the author dissects the creation process of the architectural proposals, the layout of the building, the selection of the structural style, the form-finding based on the parametric design, the optimization of the structural form, the design of the construction plan, together with the adjustment and optimization of the design and construction scheme during the actual construction process. The author highlights and concludes the importance of the collaborative design between architects and structural engineers in the design and construction process, the combination point of synergistic work and the problems arising in the actual collaboration process. By means of the practice process of this project, this paper tries to summarize the work experience of architecture and structure in the design and construction process of ice shell building, and push forward the application of composite ice shell building design and construction technology in practical projects.

Keywords: Composite ice material, ice shell, collaborative design, construction