

2016 WOOD DESIGN AWARDS - WINNER

International Wood Design

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Tsingtao Pearl Visitor Centre, Qingdao, Shandong Province, China



“The technology used in this construction demonstrates an incredible and unique engineering feat that resulted in an award-winning project.”

- jury comments

High resolution images available. Please e-mail mmclaughlin@wood-works.ca

Nestled in a mountain meadow surrounded by rocky outcroppings and narrow bands of farmed terraces in coastal China, the 28,000 square foot Tsingtao Pearl Visitor Centre highlights the beauty of the site. Besides the unique aesthetic form, two things set this building apart from the China norm: it is constructed using ordinary Canadian wood and it is done in an extraordinary way.

China has shown increasing interest in utilizing the skills of western architects but insistence that construction be carried out solely by domestic contractors has sometimes resulted in impediments to progress – felt by western architects left powerless to ensure their designs are successfully communicated and implemented.

This project was an experiment in how western designers can overcome these challenges to see their innovative designs executed in detail – even with a sophisticated form and a building material unfamiliar to locals.

A delivery method that could achieve this was key. A method was devised to parcel construction so complex components and connections could be designed and fabricated in Canada, while mass wood elements could be assembled to computer generated shop drawings by the domestic workforce. This was developed using techniques that are cutting edge worldwide, yet at the same time simple enough to ensure success.

The team developed a structural solution to respond to the desire for a signature timber structure by creating an unprecedented free-flowing wood roof plate structure, previously only thought possible with concrete.

The 39 nail-laminated timber (NLT) roof panels were fabricated on site in China using dimensional lumber, indexed slightly between laminations to create the warped shape necessary to accommodate the free-form

geometry. Many of the two-metre-wide panels are up to 40 metres long, necessitating division in two lengths for handling and erection. To avoid visual seams at these joints, a staggered pattern was developed using same length pieces to stitch together the two halves in situ. All of the roughly 25,000 pieces of lumber in the roof are straight. The undulating surface is capped with several layers of plywood to create rigidity in the direction perpendicular to the lumber.

In Canada, concurrent with the on-site panel manufacture, 93 glulam wood columns of varying length were individually tapered, milled and fitted with custom universal connectors, and shipped to China. A filigree cable-net assembly comprising small diameter glulam kingposts and thin stainless steel cables undergird the timber panels, enabling them to span up to 15 metres between column supports.

Parametric 3D modeling early on in the project was central to the realization of the roof's complex free-form geometry. The parametric model was linked to the structural analysis model, allowing a feedback loop to determine appropriate column frequency and location. This model also allowed interactive design with the architect, providing a detailed 3D model that eliminated the need for formal working drawings, and linked directly to fabrication models and shop drawings downstream.

Extensive prefabrication and planning secured the project's success, as well as compliance with an extremely tight schedule, which saw the building wholly designed and constructed in eight months. By comparison, an equivalent delivery time of a project in North America would be more like two to two and a half years.