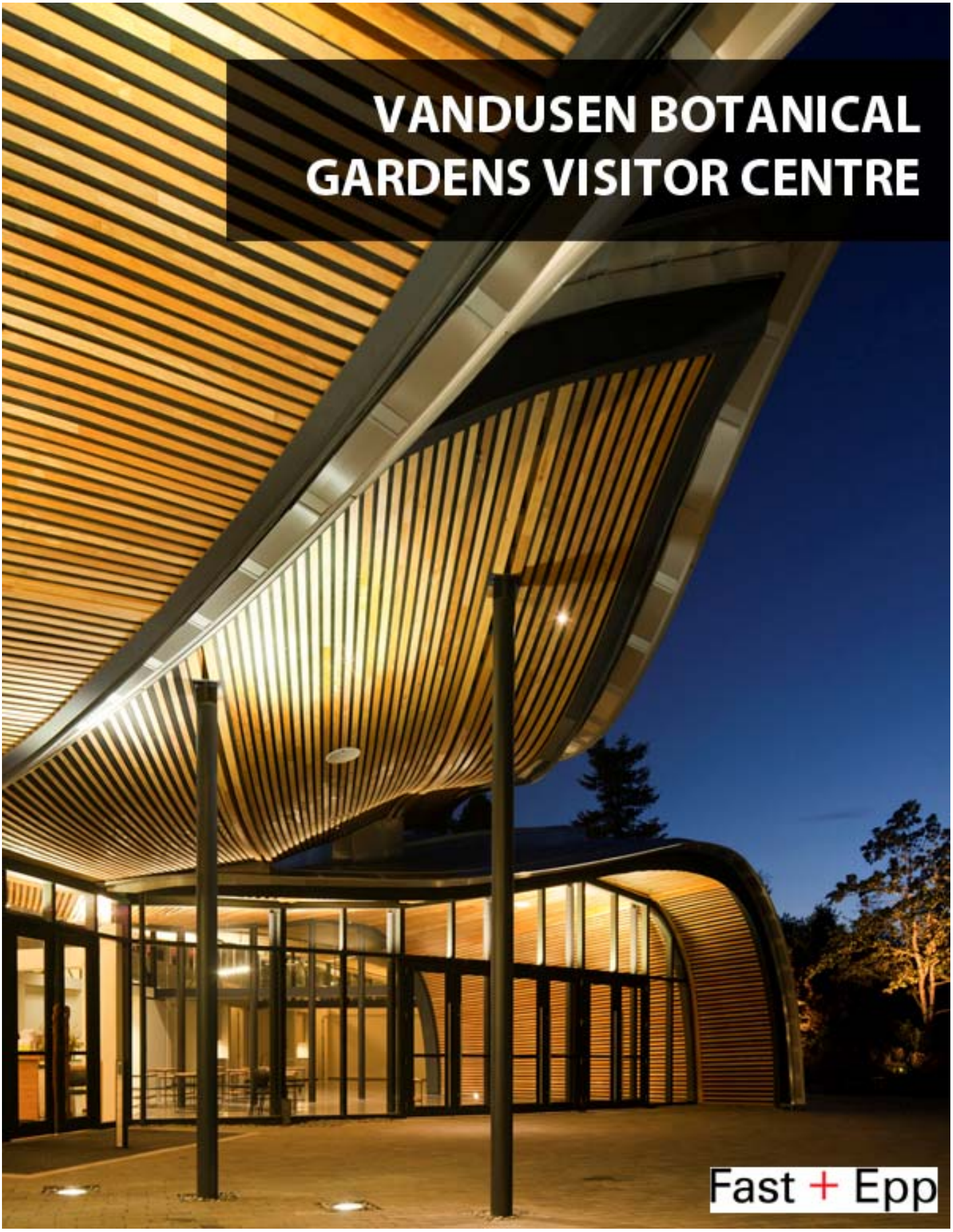
# VANDUSEN BOTANICAL GARDENS VISITOR CENTRE



Fast + Epp

# VANDUSEN BOTANICAL GARDENS VISITOR CENTRE

**Vancouver, BC**

# CANADIAN CONSULTING ENGINEERS AWARDS 2012

**Project Owner:** The City of Vancouver as represented by its Vancouver Board of Parks and Recreation

**Project Client:** Perkins + Will Canada

**Other Consultants:** StructureCraft Builders – Roof panel Design-Builders
Cobalt Engineering – Mechanical, Electrical

**Contractors:** Ledcor Industries

Sustainably-executed addition and renovation to the garden's multi-use education building, featuring an orchid-inspired free form wood roof.

Fast + Epp

201 - 1672 West 1st Avenue
Vancouver, BC V6J 1G1
T: 604.731.7412
F: 604.731.7620
mail@fastepp.com
ATTN : Sandi Wiggins

## PROJECT HIGHLIGHTS

Fast + Epp was the structural engineering firm for an iconic 19,000 sq. ft. visitors' centre at VanDusen Botanical Gardens. The striking entrance point will serve as an interactive education centre and welcome portal to revitalize public interest in the gardens. It includes lecture rooms, exhibition space, a café, and guest services.

Perhaps its most innovative feature is the dramatic free-form, organically-shaped roof structure, which metaphorically represents petals of an orchid, flowing seamlessly into the surrounding landscape like an extension of the garden itself.

The design team pioneered a wood solution for the new visitor centre in the interests of economy, sustainability, innovation, and to meet tight time constraints that had been imposed by a federal government stimulus funding program. True integrated design coordination between all architectural and engineering services accelerated on site construction and allowed those involved to meet the almost-unrealistic project schedule, as well as budget objectives.

While similarly complex building forms— like Spain's Guggenheim Bilbao Museum or the Music Experience Building in Seattle, Washington — have been achieved through the use of steel or concrete, this is believed to be the first example of wood use for such a complicated shape.

Three different high-powered computer modeling programs – Rhino, Revit and Inventor were used to develop the multifaceted geometrical shape and each individual building component. This three-dimensional technology ensured accurate in-shop assembly and precision fits when the panels later arrived on site.

Seventy-one unique panels consisting of glue-laminated wood and standard-dimensional lumber components were designed by Fast + Epp and subsequently created by StructureCraft Builders Inc. (a company owned by the principals of Fast + Epp). Engineers were able to tackle a complex problem by breaking the project down into manageable pieces – trapezoidal-shaped roof panel modules that were typically within a 3.6-metre-wide by 18-metre-long shipping size. The units consisted of doubly-curved glulam edge beams and sawn timber joists. Part of the ingenuity of this simple panelized approach was using the curved glulams as a "jig" in the shop to frame the complex geometry.

The prefabricated panels were designed to have mechanical, electrical, acoustical and ceiling finish components pre-installed, to fast track construction, avoid mid-winter rain exposure and ensure a high-quality installation. These roof panels included pre-installed thermal insulation, sprinkler pipes, lighting conduits, acoustic liner, and wood ceiling slats.

Fast + Epp developed a novel universal panel-to-column connection to avoid unique connections at every support location to accommodate the undulating twists and turns of the building's 50-foot atrium. Additionally, engineers created a lateral system to support the heavier mass of the building's green roof, locating steel braces and concrete walls strategically, so both the functional layout and breathtaking views of the surrounding garden would remain unimpeded.

Billed as "Vancouver's greenest building" by local media, the VanDusen project sets the sustainability bar for future projects at a new high. Its LEED Platinum and Living Building Challenge rating challenges others to push the envelope with wood innovation. Its sustainable features include a Green Roof almost-exclusively constructed with timber, rammed earth walls and natural ventilation.

From an engineering perspective, the main achievement and innovation was to use a highly-sustainable product such as timber almost exclusively – and in an unprecedented manner – to construct such a complex roof form. This type of work expands the industry's potential to create environmentally-conscious public buildings that are also architecturally distinct, both locally and internationally. This building encourages the generous use of simple, staple products of the local forest industry, namely dimensional lumber and plywood, as well as glue-laminated beams.

It is anticipated that the public will enjoy an intense warmth of experience in the signature landmark for generations to come, as the building flows into its surrounding landscape with flawless ease. The unparalleled use of wood redefines our expectations of traditional wood and prefabrication opportunities and methods.

Figure 1 – Exterior view of VanDusen Botanical Gardens Visitor Centre. *Photo credit: Nic Lehoux*

Figure 2 – Main entrance to visitors' centre. *Photo credit: Nic Lehoux*

Figure 3 – Interior view of the centre's undulating wood panels. *Photo credit: Stephan Pasche*


Figure 4 – Interior atrium and oculus. *Photo credit: Nic Lehoux*

Figure 5 – Novel universal panel-to-column connections. *Photo credit: Stephan Pasche*


Figure 6 – Prefabrication at the shop, using glue-laminated beams as a jig to frame the complex geometry. *Photo credit: StructureCraft Builders*

Figure 7 – Aerial view of roof panel erection. *Photo credit: StructureCraft Builders*

Figure 8 – Crews begin assembling prefabricated panels on site. *Photo credit: Duncan Bourke*

Figure 9 – A model of sustainability, VanDusen features a green roof, rammed earth walls, natural ventilation and is almost solely constructed with timber. *Photo credit: Stephan Pasche*

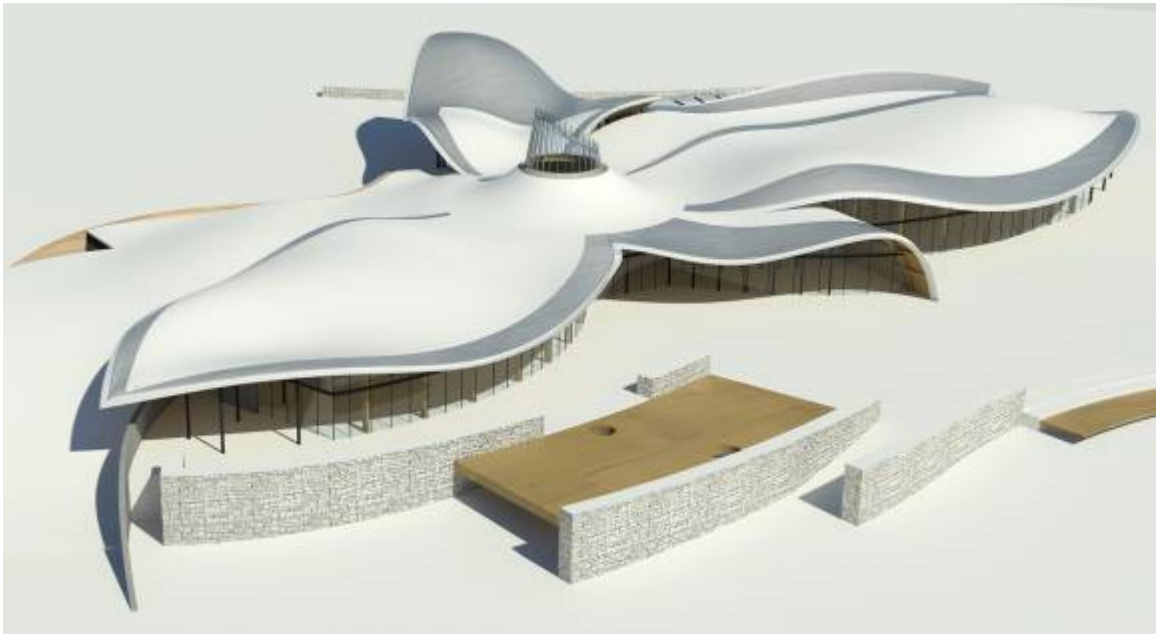


Figure 10: Architectural rendering featuring an overall view of the visitor centre and its free-form wood roof structure. *Credit: Perkins + Will Canada*

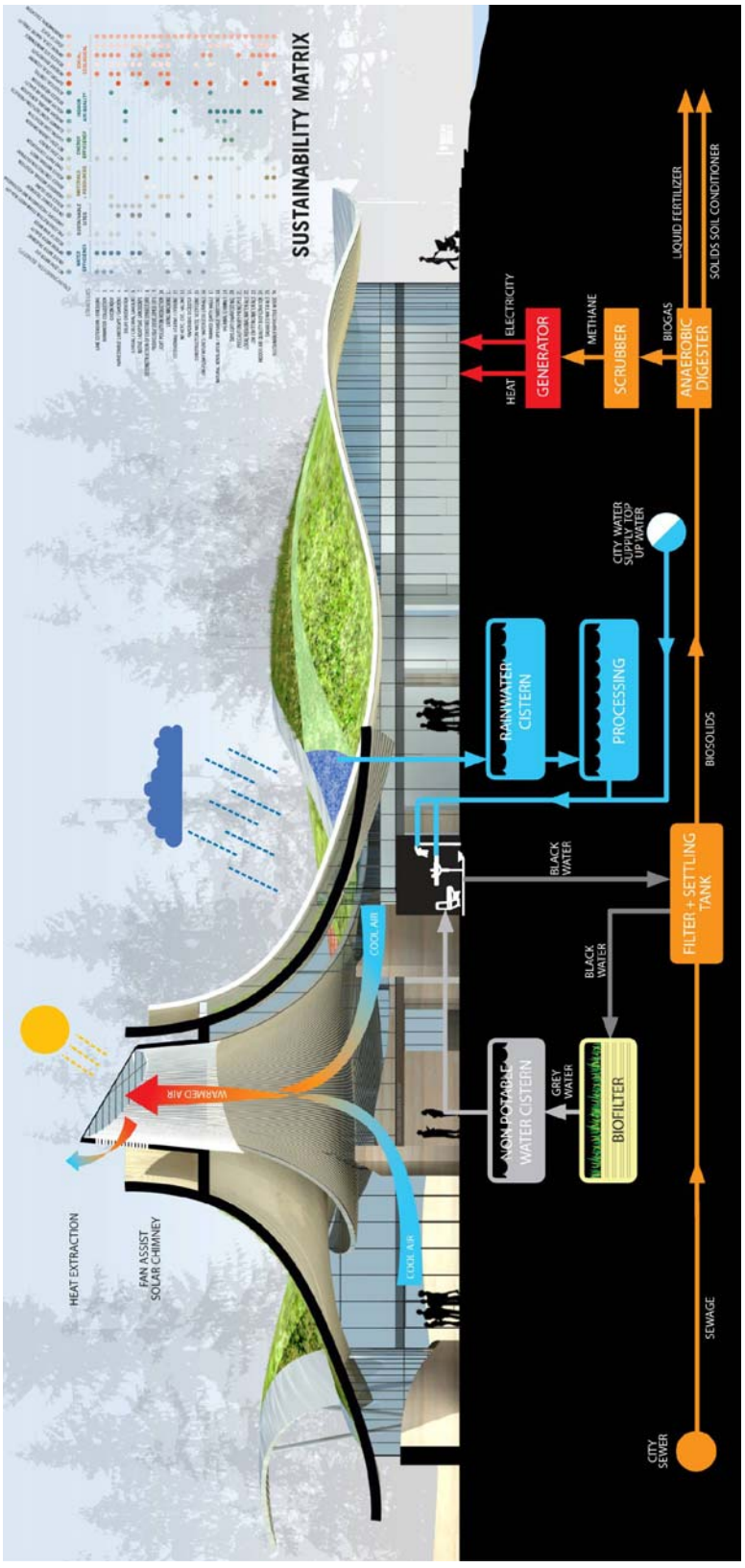
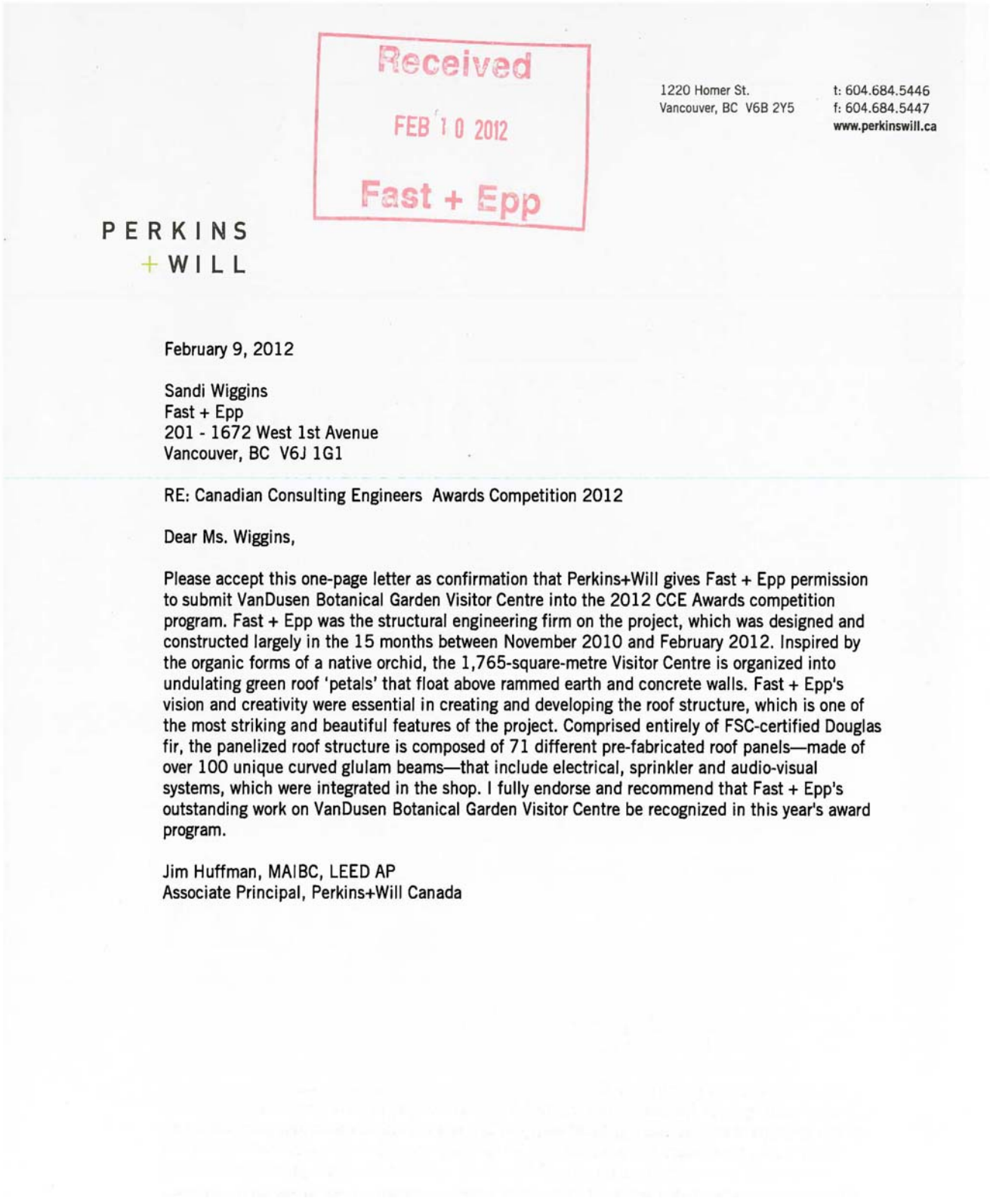



Figure 11: A model of sustainability, VanDusen targets LEED Platinum and Living Building Challenge status. *Credit: Perkins + Will Canada*


Figure 12 - Partial roof plan showing the simplicity of trapezoidal shaped panel layout to achieve complex roof form. *Credit: Fast + Epp*



Received
FEB 10 2012
Fast + Epp

1220 Homer St.
Vancouver, BC V6B 2Y5
t: 604.684.5446
f: 604.684.5447
www.perkinswill.ca

PERKINS
+WILL

February 9, 2012

Sandi Wiggins
Fast + Epp
201 - 1672 West 1st Avenue
Vancouver, BC V6J 1G1

RE: Canadian Consulting Engineers Awards Competition 2012

Dear Ms. Wiggins,

Please accept this one-page letter as confirmation that Perkins+Will gives Fast + Epp permission to submit VanDusen Botanical Garden Visitor Centre into the 2012 CCE Awards competition program. Fast + Epp was the structural engineering firm on the project, which was designed and constructed largely in the 15 months between November 2010 and February 2012. Inspired by the organic forms of a native orchid, the 1,765-square-metre Visitor Centre is organized into undulating green roof 'petals' that float above rammed earth and concrete walls. Fast + Epp's vision and creativity were essential in creating and developing the roof structure, which is one of the most striking and beautiful features of the project. Comprised entirely of FSC-certified Douglas fir, the panelized roof structure is composed of 71 different pre-fabricated roof panels—made of over 100 unique curved glulam beams—that include electrical, sprinkler and audio-visual systems, which were integrated in the shop. I fully endorse and recommend that Fast + Epp's outstanding work on VanDusen Botanical Garden Visitor Centre be recognized in this year's award program.

Jim Huffman, MAIBC, LEED AP
Associate Principal, Perkins+Will Canada

Figure 13 – Reference Letter from Client