WOODWORKS! Project of the Canadian Wood Council

Canadian Wood Council | Conseil canadien du bois

CentrePlace MANITOBA

INTRODUCTION

CentrePlace Manitoba was commissioned by the Province of Manitoba, with a goal of creating a temporary Olympic pavilion that represented the energy of the province and its people while reinforcing its commitment to sustainability. Designed as a dynamic, uniquely Manitoban architectural statement that transcends the "white fabric tent", the 232 m^2 (2500 square foot) pavilion was initially showcased at the 2010 Vancouver Olympic and Paralympic Games as both an interactive exhibit space and as a venue for business and cultural receptions.

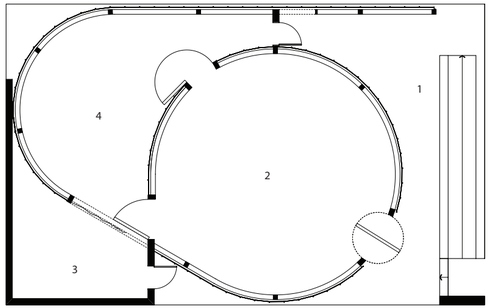
The design concept was initiated through a visioning session in June 2009 where Manitobans from diverse backgrounds came together to discuss what best represented the province they called home. The recurring themes drawn from this session gave the design team their starting point of creating an inviting space that drew upon the spirit and nature of the people of Manitoba. The simple contrast of wood and light became the basis for the creation of a pavilion that would become a beacon, welcoming visitors through a generous front porch and an oversized pivoting door.

The design team met client design objectives by making a number of strategic decisions to ensure that the project would showcase the province's commitment to sustainability and provide a legacy building that would serve beyond the pavilion's initial five-week purpose. One of the key objectives was to ensure Universal Design and Access. To achieve all these design requirements, CentrePlace Manitoba had to:

- utilize Manitoba labour and regional materials
- offer an interactive exhibit space showcasing Manitoba's unique culture
- be efficient in material use and energy consumption
- be compact, transportable, and 100% reusable at a future site
- favour passive systems over dedicated ones

TOP: Photo courtesy of the Province of Manitoba (Rob Kennedy)
BOTTOM: Photo courtesy of Dominion Construction (Gerry Harms)

1 Queuing Area
2 Exhibition Area
3 Storage
4 Multi-Purpose Area



SITE DEVELOPMENT & ECOLOGY

The pavilion stands 5.79 metres tall (19') and features 7.32 metre spans (24'). One of six pavilions on the LiveCity site in Downtown Vancouver, CentrePlace Manitoba's location encouraged pedestrian activity and the use of public transit eliminating the need for vehicular parking on the site.

Since the post-games site in Manitoba was not known at the time of the design or construction, the structure had to be adaptable. Therefore, the pavilion was conceived to sit lightly on its initial site, a surface parking lot. Designed to maximize the bearing capacity of the asphalt lot, the structure was spread out to eliminate
damage the site.

CentrePlace Manitoba is now located at the Red River Exhibition Park in Winnipeg, Manitoba where it was re-assembled in the summer of 2010.

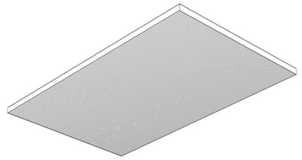
THE STRUCTURE

The structural system was designed with two main considerations: 1) to incorporate materials that showcased local resources and ingenuity and 2) to employ prefabricated elements to allow for a short construction period. The result is an entirely wood framed structure. It consists of a simple 12.19m x 19.51m (40’ x 64’) roof ‘slab’ suspended by two main beams on slender glulam columns above an equally simple rectangular floor plate (see FIG. 1).

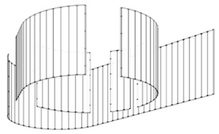
The floor and roof were prefabricated in Manitoba in 2.44m x 12.19m (8’x40’) panels. The floor panels were built with standard 2x8 joists with blocking and openings positioned for columns and wire cross-bracing tie-downs. Constructed with TJI joists, the roof system was a combination of oriented strand board (OSB) and microllam, which uses two-thirds less wood than traditional dimensional lumber joists.

The exterior structural fascia beams were constructed from parallam. The glulam frame, manufactured locally, used simple beams and columns with bolted connections that facilitated deconstruction and future reassembly on a more permanent site. The glulam girts were incorporated into the media displays, providing the frames and lashpoints for the fabric and projected content. Even the plywood strapping, used to transport the roof and deck structures, was re-used for the exterior cladding. A low VOC sealant was used on various exposed wood areas.

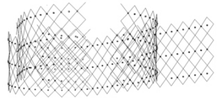
The roof panels were framed with engineered wood I-joists, sheathed with plywood on top and salvaged elm slats on the underside. The panels were suspended from two 2.13m x 5.79m (7’ x 19’) parallel-strand lumber (PSL) beams with steel strap saddles on each joist. During construction, the entire roof ‘slab’ was fastened to the beams while on the ground and, with the 1.83m x 2.13m (6’ x 7’) spruce/pine/fir (SPF) glulam columns in place, the entire roof assembly was hoisted with a large overhead crane and lowered into place.



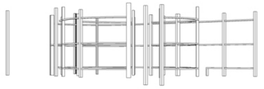
Reclaimed Elm Soffit



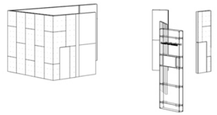
Polycarbonate Panels



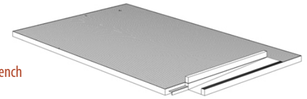
Steel Cable & Aluminum Brackets



Glulam Columns & Beams



Over-sized Pivoting Door



Reclaimed Elm Flooring & Bench

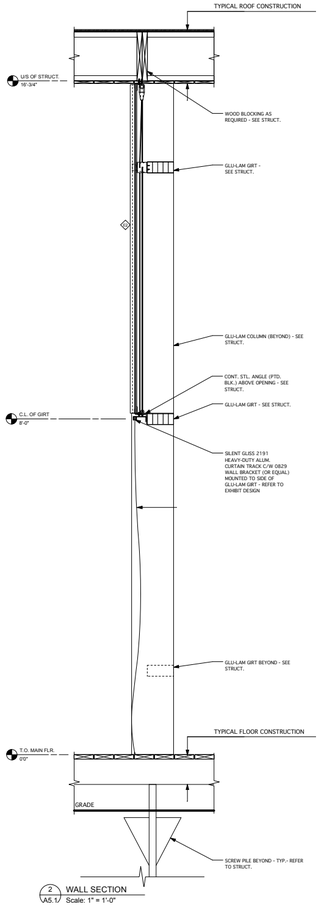


FIGURE 1

The structure is designed with simple connections to be completely demountable, enabling the material to be recovered for future use with no loss of structural value.

ALL: Photos courtesy of Wolfrom Engineering (Dan Petrak)

CentrePlace Manitoba was awarded the Sustainability Star by the Vancouver Olympic Committee (VANOC).

SUSTAINABILITY

The pavilion was designed and constructed as a green building employing creative sustainability solutions to the challenges presented by the unique use of the structure and its budget constraints.

Prefabrication enabled the utilization of Manitoba labour and also fulfilled a number of sustainability considerations: limiting the amount of material used, minimizing construction waste, reducing costs and making the project easier to transport and assemble. The building components fit on 3 flatbed trailers for transport to Vancouver and shipping materials were re-used in the actual construction of the pavilion.

The choice of materials, however, offered the greatest contribution to sustainable design. Much of the engineered wood products were made from regional sustainable forests[1]. Since wood products sequester more carbon dioxide than the amount emitted during harvesting, transportation, and manufacturing combined, they actually offer a negative greenhouse gas footprint[2]. Additional materials used included a large recycled and/or re-used component, including salvaged Elm originally destined for the landfill.

As Winnipeg is home to the largest urban population of Elm trees in North America, Dutch Elm disease is a common problem. A tree, once infected, must be removed and disposed of, even though only the bark is contaminated. For this project, rather than adding to the city's landfill, 100 trees were salvaged to produce the 7,000 board feet of timber required for the pavilion's flooring and soffit as well as a 7.62m (25') long bench used for exterior seating.

The translucence of the 100% recyclable polycarbonate panels, fabricated from 10% post industrial material, allowed exhibit designers to project onto the surface while allowing diffused natural light into the space during the day. The wire cross-bracing, necessary to resist wind loads, was exposed, providing additional texture to the interior finish. The aluminum brackets supporting the panels were composed of 49% post-industrial content and 6% post consumer content. Using these aluminum brackets, as opposed to full height sections, reduced the use of support material by 90%. The steel cables provided a light and easily transportable lateral bracing mechanism.

While the ENERGY STAR compliant multi-media equipment meant consumption of electrical power was inevitable, the remainder of the building was designed to use as little power as possible. Diffused, natural day lighting filters into the space through the translucent skin of the building to provide enough light that additional dedicated lighting is not required.

[1] "Canada's forests are 94% publicly owned and managed by the government…Less than one half of one percent of Canada's managed forests is harvested each year and by law all public lands that are harvested must be successfully regenerated…." Canadian Wood. Renewable by Nature. Sustainable by Design.

[2] A Cradle to Gate Life Cycle Assessment of Canadian Softwood Lumber, 2009; The Prospects of Carbon Neutral Housing, 2008.

WOOD & LIFE CYCLE CONSIDERATIONS

Life cycle assessment is a rigorous and systematic approach that thoroughly quantifies environmental impacts. It is currently the best method to determine the "greenness" of a product[3]. Numerous life cycle assessment studies worldwide have shown that wood products yield clear environmental advantages over other building materials and scientific analysis shows that wood has the lowest environmental footprint of all major building materials[4] (FIG.2).

With an initial life span of only 5 weeks, the life cycle of the pavilion's building materials were of keen interest. The entire pavilion was designed to be re-assembled at a future more permanent site so a longer service life was required. This 'post-Olympic' life was an important consideration in the structure's design, detailing and construction. Since wood is lightweight, strong, durable, and has excellent thermal[5] and load bearing properties, it was an ideal choice for the project.

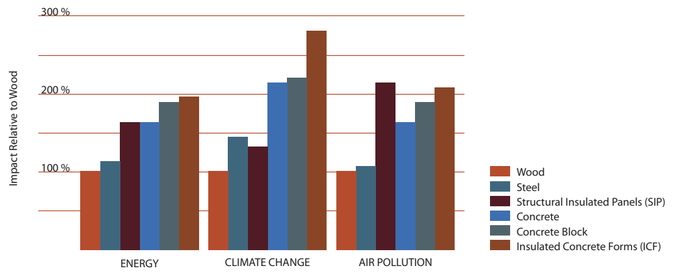
3 Canadian Wood Council, Forest Products Association of Canada and Forestry Innovation Investment, 2009: Canadian Wood. Renewable by Nature. Sustainable by Design.

4 FP Innovations, 2008: A Synthesis of Research on Wood Products and Greenhouse Gas Impacts.

5 "Wood is far more resistant to heat flow than other materials, which means it is easier to insulate... Wood is 400 times better than steel and 10 times better than concrete in resisting the flow of heat... Consortium for Research on Renewable Industrial Materials (CORRIM), 2005: Life Cycle Environmental Performance of Renewable Materials in the Context of Residential Building Construction

LIFE CYCLE ASSESSMENT: WOOD IS A GOOD CHOICE

FIGURE 2



Embodied Environmental Impacts of Various Exterior Wall Assemblies

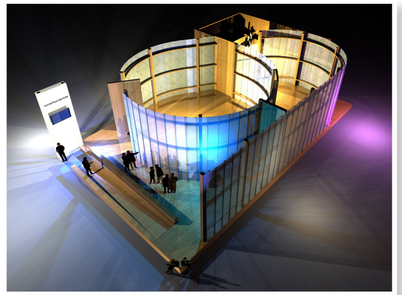
The floor decking used was from salvaged Dutch-Elm diseased trees originally destined for the landfill.

ABOVE: Photo courtesy of the Province of Manitoba (Rob Kennedy)

LIGHT & AIR CONSIDERATIONS

The pavilion relies on the use of passive systems to mitigate and control over-heating from electrical equipment and potentially large occupant loads. Translucent panels maximize natural lighting while reducing solar glare. Floor and soffit board spacing and an oversized pivoting door allow the structure to draw-in outside air, providing natural ventilation while offering a sensory connection with the outdoors. Since the extensive multimedia display provided sufficient interior light, additional dedicated lighting systems were not required. By pursuing a passive ventilation approach and a lighting design that maximized natural and borrowed exhibit light, the need for dedicated HVAC and lighting systems was significantly reduced.

Winner of two Prairie Wood Design Awards in 2010



CONCLUSIONS

Designed as a green building, CentrePlace Manitoba is an architectural expression of the culture and people of the province. The project employed a cost-effective construction system based on regionally harvested and manufactured materials, effectively utilizing local skilled labour, enhancing the regional economy and creating a durable, adaptable and functional building. A well considered demonstration of sustainable design; CentrePlace Manitoba offers a clear example of how wood construction can meet budget constraints and sustainability considerations while providing significant architectural appeal.

Note: The approximate dimensions of the final structure on its permanent site in Winnipeg measure 12.19m x 19.51m (40' x 64'). The interior space is approximately 144m^2 (1550 square feet) with 80.82m^2 (870 square feet) as exhibit space; 46.45m^2 (500 square feet) as reception area for conferences and other events; and 16.72m^2 (180 square feet) as storage space.

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Project of the Canadian Wood Council

www.wood-works.org

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