Banff Recreation Centre

Canadian Wood Council
Conseil canadien du bois

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Project of the Canadian Wood Council

Photo: Steve Nagy Photography

Cover Photo: Steve Nagy Photography

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Introduction

The Town of Banff is located in Banff National Park, Canada's first national park and a UNESCO World Heritage Site. It is home to over 8,700 residents and greets more than three million visitors from around the world each year. Constructed in 1958, the town's recreation centre was in dire need of improvement—the roof of the curling rink was considered to be deficient, the hockey rink locker rooms were no longer adequate, the ice refrigeration piping system needed replacement, and additional skating space was needed. The solution was a combination of demolition and reconstruction, refurbishment, and new construction.

Completed in 2011 to the LEED® Silver standard, the redeveloped Banff Recreation Centre has a new curling rink, a refurbished hockey arena, a new NHL-sized hockey arena, and new meeting rooms, lounges and a concourse. The new construction uses wood and glass to provide views of the mountains, while providing superior thermal performance.

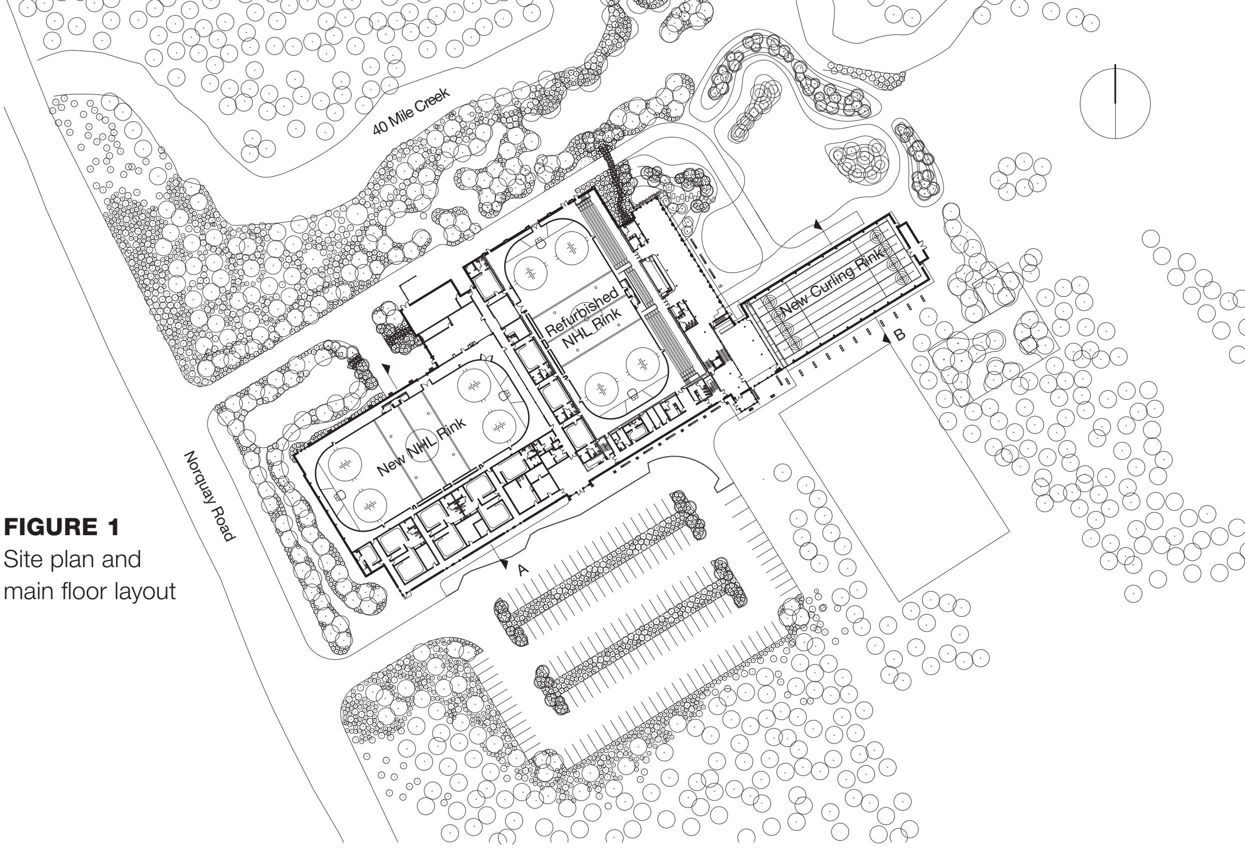

FIGURE 1
Site plan and main floor layout

Banff Recreation Centre Redevelopment

Figure 1 shows the site layout and the main floor plan for the redeveloped facility. The four-sheet curling rink and lounge (east side) were built on the site of the old curling rink. The floor slab and refrigeration piping for the original hockey rink (center) were replaced and new locker rooms were provided. The new concourse between the hockey rink and the curling rink serves as a gathering place and an eventual home for a hall of fame. The new hockey rink is located to the west of the original hockey rink.

Extensive landscaping changes were made to consolidate parking and restore vegetation to the north of the Centre to provide a wildlife corridor along 40 Mile Creek.

The design was expected to meet strict Town of Banff architectural design guidelines that included: strong, sloped roof forms with deep overhangs; a maximum 10-m building height; exterior materials having significant detailing, relief, and texture; and the use of local materials. Highly-reflective metal roofing was discouraged. It was agreed that a dark-coloured, non-reflective, standing seam metal roof would make the building less conspicuous when seen from high mountain vantage points.

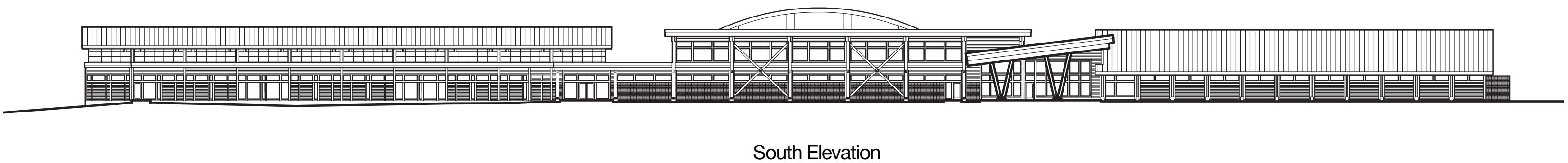

FIGURE 2
South elevation showing the new hockey rink (left) main entrance and original hockey rink (centre) and curling rink (right).

Use of Wood

Glulam elements were used as the primary supports for the roofs of the new curling rink and the new hockey rink. The roofing system is comprised of:

- prefinished aluminum roofing;
- air space with 241 mm nylon thermal clips;
- 200 mm fibrous batt insulation with foil face vapour retarder; and,
- steel z-girt purlins.

Alaskan yellow cedar columns were used to support the glulam trusses for the new hockey arena and to frame the main entrances. Glulam columns were used to support the glulam arches in the curling rink.

The infill wall construction is:

- western red cedar siding;
- 6 mm polymer drainage and ventilation matt;
- 2 layers (shingle-lapped) of 30 minute building paper;
- 13 mm plywood sheathing;
- 38 x 184 mm (2x8) wood studs @ 400 mm o.c. (in some cases, LVL or PSL studs were used);
- 185 mm fibrous insulation; and,
- polyethylene air/vapour barrier.

The exterior is clad with 32 mm, rough-sawn, fire-retardant-treated western red cedar. Both channel ship-lapped and bevel-lapped profiles were used.

Poplar wood panels were used as interior finish for the concourse walls.

Structure

The roof and structure of the original hockey arena were retained, while the ice refrigeration system was replaced. The new curling rink roof is supported by glulam arches salvaged from the old curling rink. Salvaged glulam was also used for columns throughout the redeveloped complex.

The roof of the new hockey rink is comprised of glulam arches made from new material. The glulam for the concourse, meeting rooms and other areas was a combination of new and recycled glulam.

Reusing glulam

Beams from the 1958 curling rink and glulam beams from a dismantled school in Canmore were used for the new curling rink. The glulam was sent to the Structurlam plant in Penticton, British Columbia, for inspection, planing, resizing, milling for connections, and refinishing.

Salvaged members were inventoried and inspected. Samples were tested to modern standards at the glulam manufacturing plant to determine the suitability of the members for re-use. Some members were cut to create two smaller members.

The salvaged members were refinished so that the only difference between them and the new glulam is the scarf joints in the laminations. Although additional transportation was involved, it was offset by reduced demand on virgin materials.

In the field of structural materials, this reuse of glulam elements, with only minimal remanufacturing, is unique.

Sustainable Design

The Banff Recreation Centre was designed for and is a LEED® New Construction Silver candidate. The reuse of glulam members minimized waste, reduced transportation energy, and reduced volatile organic compounds (VOCs) and toxic materials. Occupancy sensors are used to minimize lighting energy. Low-emissivity ceilings in the rinks reduce the amount of energy required to maintain good ice by about 20%. High-efficiency fans and pumps with variable speed motors reduce process energy. Demand-controls mean that ventilation is driven by air quality.

The site was developed to help rehabilitate the sensitive environment nearby. The new building was situated away from Forty Mile Creek; the riparian zone, previously occupied by the outdoor ice and parking, was rehabilitated to facilitate a wildlife corridor. Bioswales were constructed to capture and treat stormwater runoff from the parking lot, which is used for flushing low-flow toilets in the Centre. The melt water from the ice rink surfacing is also contained and treated before release. Both these improvements vastly reduce detrimental effects on Forty Mile Creek.

The building exceeds the Model National Energy Code for Buildings (MNECB) by about 50% compared to the 1997 version (about 25% compared to the 2011 National Energy Code for Buildings (NECB)).

Meeting Building Code Requirements

The Banff Recreation Centre was categorized under the Alberta Building Code as an assembly occupancy type—Group A, Division 2. Applying code requirements for an A-2 occupancy instead of an A-3 occupancy allows the curling rink to have more versatility and be used as a multi-purpose space without annual limit on the number of events, such as

Photo: Steve Nagy Photography

The Centre is sprinklered throughout. The majority of the overhangs extend more than 1,220 mm out from the building and the concealed spaces within the overhangs are sprinkler-protected in accordance with NFPA 13.

The Banff Recreation Centre has a ground floor area of 8,533 m^2, larger than the 4,800 m^2 permitted for a one-storey, A-2 occupancy. A 2-hour firewall breaks the centre into two buildings: the original hockey rink, new curling rink, concourse, and mezzanine (4,608 m^2); and the new hockey rink, refrigeration plant, and ice resurfacing room (3,925 m^2).

The Centre is located in a high-risk wildfire area and therefore it was decided to use fire-retardant treated wood for siding, exterior trim, and soffits.

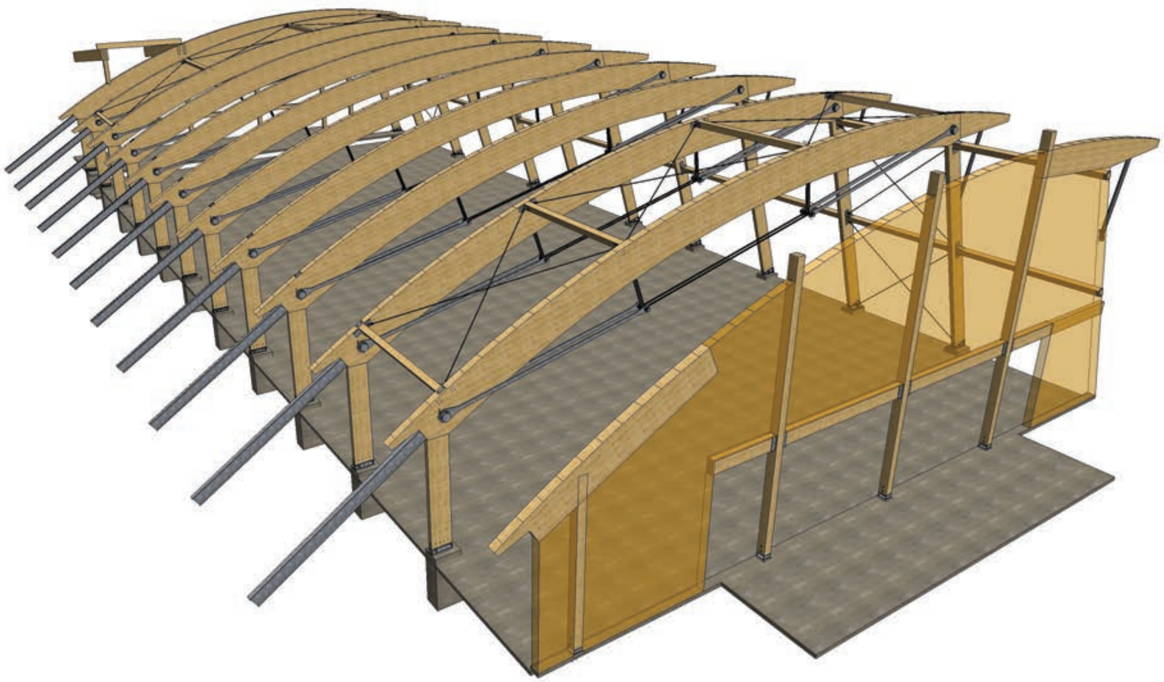

Photo: Structurlam

More Reasons for Using Wood

The United Nations' Intergovernmental Panel on Climate Change (IPCC) deems buildings to be the greatest opportunity for making considerable reductions in carbon dioxide emissions. The IPCC also recognized the tremendous role forests and wood products can play in mitigating climate change by both avoiding harmful greenhouse gas emissions as well as sequestering atmospheric carbon in wood.

Using sustainably harvested wood as a construction material is a simple and cost-effective step in this direction.

Carbon Dioxide

Carbon dioxide is a key factor of global warming and it is also a major ingredient of wood. As trees grow, they draw carbon dioxide from the atmosphere and, using solar energy, convert the carbon dioxide into wood fibre (50% of wood is carbon) while releasing oxygen back into the atmosphere. If trees are harvested before they burn or decay, the carbon is stored for the life of the wood products, and new trees are planted to begin the carbon cycle again.

Wood products sequester more carbon dioxide than the amount emitted during harvesting, transportation and manufacturing, which means they actually have a negative greenhouse gas footprint. As well, for every tonne of wood grown, more than 0.7 tonnes of life-giving oxygen is produced.

Carbon Footprint

The redevelopment of the Banff Recreation Centre involved both renovation and new construction. Glulam timber beams from the original structure were recovered, reconfigured and re-installed in the structure, thereby reducing the amount of new material required. As well, new timber and wood products were used, including dimensional lumber, siding and glulam beams. There were significant environmental benefits gained from this strategy.

Photo: Craig Douce

The use of wood products has positive impacts on the building carbon footprint in two ways:

1. The wood acts as a carbon store for as long as the building exists; and,

2. The high emissions associated with the use of other materials are avoided.

The total mass of new and used wood products was more than 500 tonnes. As half the weight of wood is carbon, the total carbon sequestered in the Centre is 250 tonnes. This is equivalent to more than 900 tonnes of CO_2. In addition, the emissions avoided by using wood rather than other structural materials are estimated to be more than 1820 tonnes, resulting in a net CO_2 benefit of more than 2700 tonnes. This is about the same impact as removing 523 vehicles from the road for a year or avoiding the CO_2 emissions from the combustion of 6300 barrels of oil.

Wood and Life Cycle Assessment

Life cycle assessment is a scientific measure of the environmental impact of a product throughout its entire life—from resource extraction through to product manufacturing, on-site building construction, occupancy, and eventual demolition, as well as disposal, reuse, recovery for energy or recycling. Numerous life cycle assessment studies worldwide have shown that wood products yield clear environmental advantages over other building materials at every stage.

Scientific analysis of building materials shows that wood has the lowest environmental footprint of all major building materials. Life cycle assessment takes away environmental performance guesswork by calculating actual outcomes based on quantifiable indicators of environmental impact, such as global warming potential, resource use, embodied energy, air pollution, water pollution and solid waste.

Photo: Gleb Gomberg

> "Specifying wood in public procurement can help fulfill national and local climate change programmes. Encouraging the use of wood products can act as a greener alternative to more fossil-fuel intensive materials. Substituting a cubic metre of wood for other construction materials (concrete, masonry blocks or clay bricks) results in the significant average of 0.75 to 1 t CO_2 savings."

International Institute for Environment and Development
http://www.iied.org

The ATHENA® Sustainable Materials Institute provides web-based life cycle assessment tools (www.athenasmi.ca) that allow architects, engineers and others to quickly assess and compare environmental impacts of hundreds of building assemblies that are commonly used in construction.

As environmental awareness grows, building professionals are finding wood is an excellent choice for green construction designs that minimize the use of energy, water and materials, and reduce negative impacts on human health and the environment. Wood is a high-performance and versatile choice for any new construction or renovation. Wood is light in weight, yet strong. It has excellent load-bearing and thermal properties, is easy to work with, and is well suited for large or small projects. Wood adds warmth and beauty to any building, and has been shown to enhance the well-being of occupants.

Forest Management

Canada leads the world in third-party sustainable forest management certification. This independent verification provides added assurance of responsible forest practices from a country with some of the world's toughest and well-enforced forestry regulations.

Canada's resource managers practice sustainable forest management to maintain and enhance the long-term health of natural forest ecosystems while providing environmental, economic, social and cultural opportunities for present and future generations. Canada has more than 400 million hectares of forest and other wooded land. This represents 10% of the world's forest cover and 30% of the world's boreal forest. Less than one half of one per cent (< 0.5%) of Canada's managed portion of its forest is harvested each year, and by law all public lands that are harvested must be successfully regenerated.

Canada has 91% of its original forest cover, more than any other country, and its rate of deforestation—the permanent conversion of forests to non-forest uses such as agriculture or urban development—has been virtually zero for more than 20 years.

Certification

Forest certification is an important tool used by forest companies, governments and buyers around the globe to ensure that forest products come from sustainable and legal sources. In third-party certification, independent auditors review forest operations for compliance with standards that address environmental, social and economic issues of concern. No other construction material has the same rigorous review of its extractive processes as wood. As of January 2011, Canada had 149 million hectares (368 million acres) of forest, both commercial and some non-commercial areas, certified to one of three credible third-party programs—the Canadian Standards Association, the Forest Stewardship Council and the Sustainable Forestry Initiative. This is 42% of the world's certified forest area.

Original glulam beams being salvaged from original building
Photo: GEC Architecture

Conclusion

The Banff Recreation Centre redevelopment maximized utilization of the original hockey rink and salvaged and new materials to create a revitalized facility truly fitting of its spectacular location. The wood structures' interior and exterior finishing provide an architectural atmosphere that meets the Town of Banff's design criteria, matches the building heritage of the Canadian Rockies, and creates a pleasing environment for ice sport enthusiasts.

Photo: Gleb Gomberg

Photo: Craig Douce

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