



North Bay Regional Health Centre

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Photo: John Minkowskyj, EBHW Architecture Inc.

Cover Photo: Ed Eng, www.edeng.net

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North Bay Regional Health Centre

Located at the eastern end of Lake Nipissing on the voyageur route linking Lake Superior to salt water, North Bay, in modern times, has a diversified economy and also serves as a transportation and service hub for resource-rich northern Ontario. With a local population of 56,000 and a much larger regional population, investigations began in the late 1990s to review the adequacy of three aging hospitals and options for refurbishment or replacement. Detailed analysis of the existing facilities and the region's health care needs resulted in the decision to build a new facility.

The North Bay Regional Health Centre (NBRHC) is comprised of the District Hospital (acute care) and the Regional Mental Health Centre (specialized and forensic mental health services).

The North Bay Regional Health Centre is a new model for health care in Canada. In addition to the generous use of structural and decorative wood elements to help create a healing environment, it includes many firsts for Canadian health care.

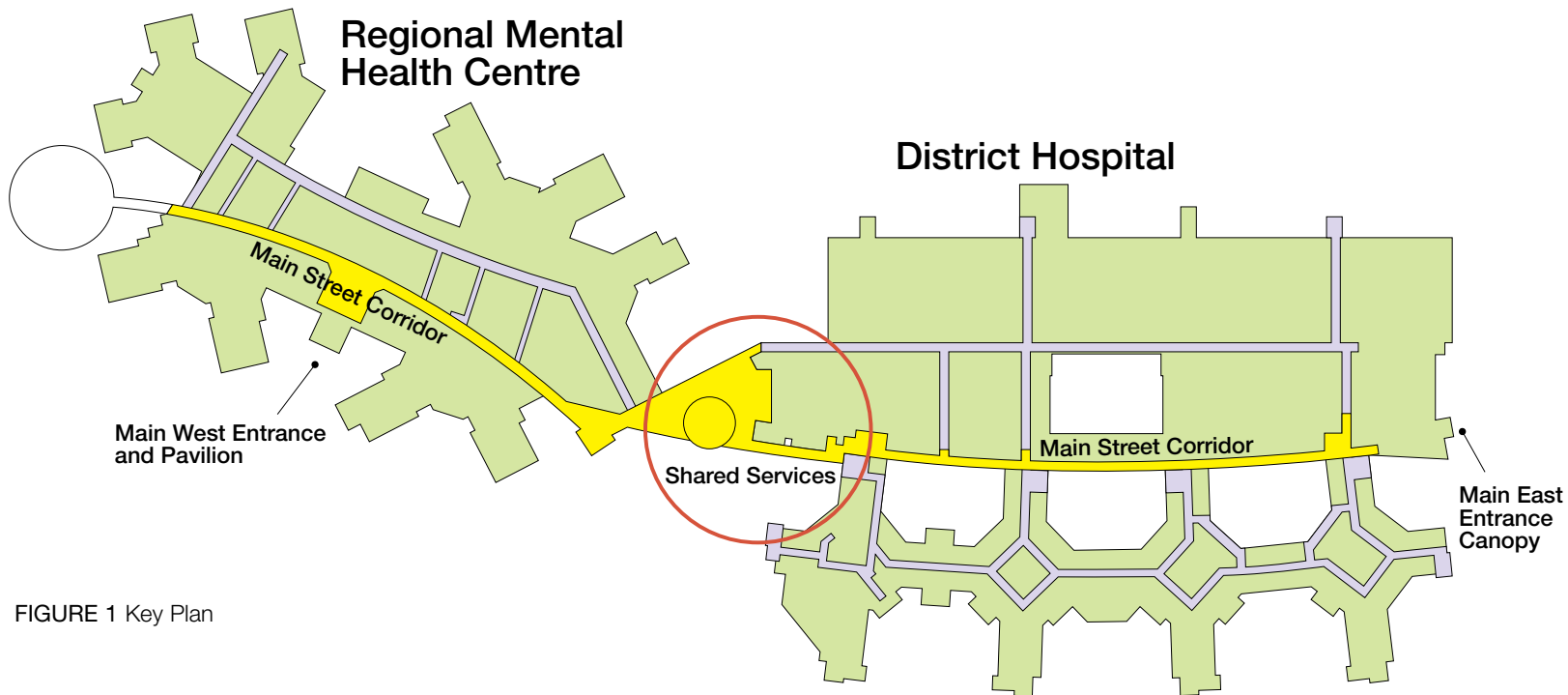


FIGURE 1 Key Plan



Project Description

The hospital is located on a 32-hectare (20 hectares buildable) site adjacent to Highway 17. The District Hospital has 275 acute care beds and the Regional Mental Health Centre has 113. Combined, the two buildings have a gross area of 70,171 m² (754,938 ft²).

Design Process

The new North Bay Regional Health Centre amalgamates the two sites of the former North Bay General Hospital and the former Northeast Mental Health Centre. The initial options analysis assessed the feasibility of modernizing the old hospitals. It was concluded the cost would be comparable to a new complex

and would leave some shortcomings. Once the decision was made to build a new health care centre, 28 potential sites were considered. The site selected was deemed to provide the best natural setting and the best access for residents of North Bay, as well as those of the surrounding region. It also has room for future expansion. High- and low-rise buildings were considered for the facility and in the end it was determined that low-rise construction would best meet patient needs.

Design began in 2000. There were three main design groups: one for the acute care areas, one for the mental health areas, and one for support and shared service areas. The building design strove to incorporate healing features for patients, visitors and staff espoused by Harvard University professor Jain Mailkin, which are summarized in Table 1.

TABLE 1 Design objectives

Involve the five senses	Sight: concept of a village on a hill, human scale, use of recognizable icons, design variety (each RMHC home is different). Sound: music and quiet areas in the Main Streets. Touch: pleasing materials - wood, stone, and water (glass). Taste: decentralized food services. Smell: connection to outdoors, food experience.
Provide a connection with nature	The building's orientation follows the shape of the escarpment that it abuts; it is linked to gardens, a greenhouse, a community garden plot, hiking paths, a native sweat lodge and a spiritual labyrinth.
Avoid environmental stressors	Patients should have some control over their environments, such as lighting and food.
Provide adequately sized, well designed work spaces	The public and staff were involved in the design. For example, mock-ups of main rooms were erected in local shopping malls and the public and health care professionals were invited to provide feedback and suggestions.
Break the institutional grid	The centre is designed as a village concept with two connecting Main Streets, neighborhoods, and town centre. Wood was used to connect with nature and create architectural character.
Meet functional requirements	All staff functional parameters were integrated into the design. The functional plan provided a guide and the team created the setting.
Introduce positive distractions	Many unique features create positive distractions. Original artwork by local resident Lynn Johnson, creator of the "For Better or Worse" cartoon strip, is on display. The hospital has an artist-in-residence program. Colours, materials, and sunlight create a warm, healing environment.
Address psychological issues including ethnic and cultural diversity	The hospital's design takes into account the culturally diverse needs of North Bay including First Nations peoples.
Consider the patient's point of view	For convenience, the acute care and the specimen collection areas are located near the front door. The building has <i>universal design</i> accessibility. Staff and patients have a strong visual connection to nature.

The 2003 SARS outbreak in Toronto occurred part way through the design process and resulted in redesign to provide isolation control for certain areas. The 39-month construction period ended in July 2010 and the new facility opened January 31, 2011.

Innovations in Health Care

The North Bay Regional Health Centre (NBRHC) is considered a new model for health care due to many innovations. Here are a few examples:

- The NBRHC is the first use of wood in a B-2 Occupancy in Ontario – a carefully considered step that greatly de-institutionalizes the character of the facility and provides a better healing environment.
- The NBRHC is the first hospital in Canada to provide 100% fresh air to every room with one complete air change per hour. To do this efficiently, heat-recovery wheels are used to recover heat from exhaust air. The heat exchange system is capable of recovering 75% of heat when the outdoor temperature is -30°C .
- This is the first instance in Canada where an acute care hospital and a mental health centre have been co-located, enabling the facilities to share some services.

Photo: Ed Eng, www.edeng.net



- The forensic mental health units include a courtroom that enables determination of whether a patient belongs in a hospital or in the criminal justice system.
- Food and food delivery was recognized as a major contributor to healing and steps were taken to improve the reputation of hospital food. For example, decentralized food service occurs through locally-assembled food trays from nutrition centres located close to points of care. Patients are provided more choice in food selection and portion size. Assisted- and self-preparation of 'pantry food' is available to capable and willing patients. Regional Mental Health Centre patients can cook their own food in a home-like environment.
- Stress is known to be a barrier to healing. Most of the patient rooms have oversize windows and southern exposures to admit sunlight. The few double rooms are designed so closed curtains around the patient closest to the window allow sunlight to reach the patient in the bed away from the window.
- Deliberate measures were taken to depart from a typical institutional grid. For example, the main corridors are curved, and have small alcoves that provide privacy. The design palette used a wide variety of colours and materials.
- Work is underway to have the facility become the first Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ certified hospital in Ontario and the second in Canada. The NBRHC pursued LEED design out of a belief that hospitals should strive to minimize their impact on their local environments. Environmental design also prolongs the building's life, improves its quality, and improves patient and employee satisfaction by minimizing air quality issues. Reducing energy consumption also helps lower operating costs, thereby maximizing the dollars spent directly on patient care. It is calculated that striving to meet LEED objectives will result in a cost reduction of \$825,000 for electrical and mechanical equipment, annual energy savings of \$434,000 per year and a reduction in greenhouse gas emissions of 1,890 tons per year.

The Use of Wood

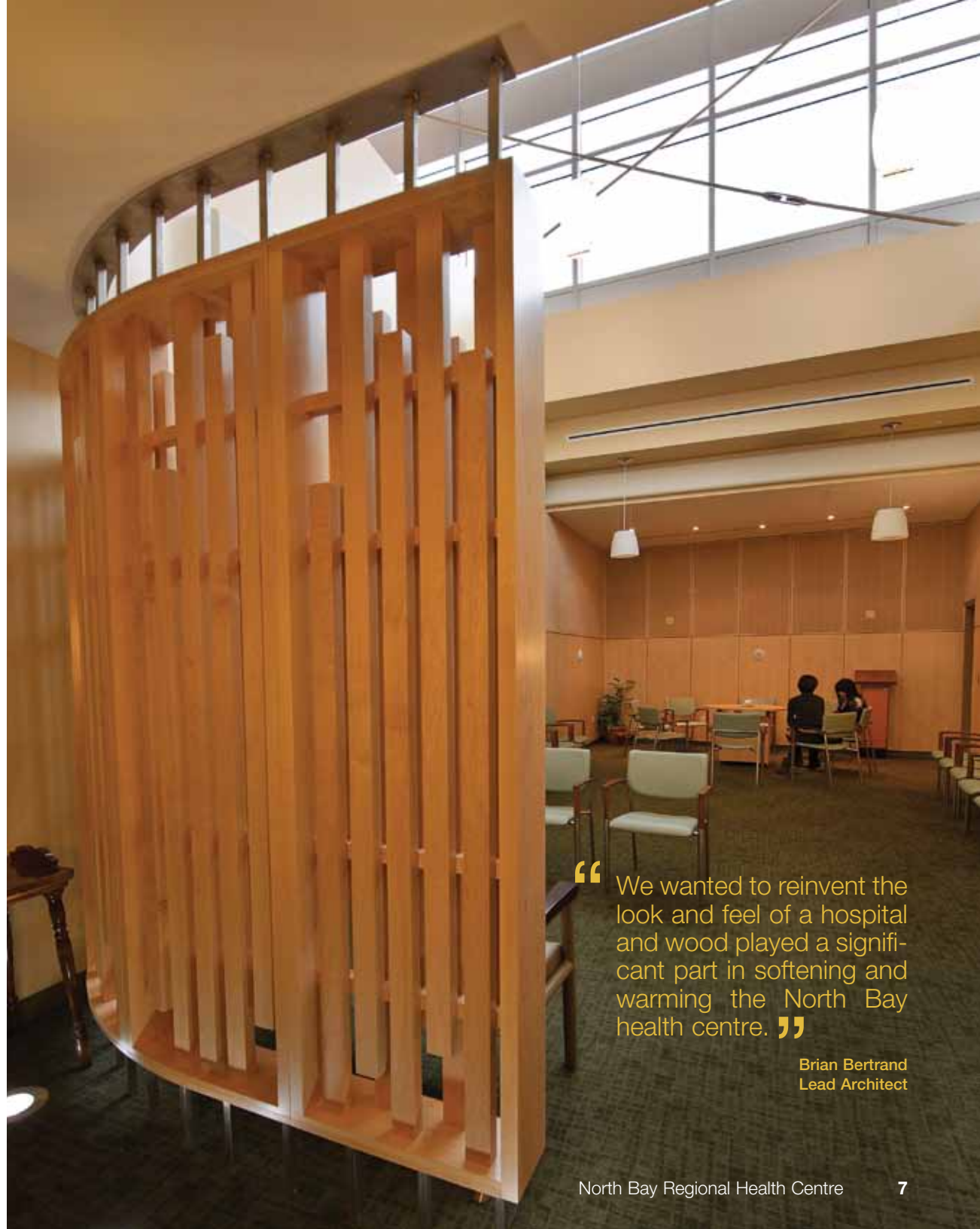
There are several reasons why the use of wood in structural and decorative applications greatly enhances this health complex.

First and foremost, wood complements the driving design philosophy of the facility. It makes the hospital feel less institutional, and gives patients an environment where the healing process has every chance to succeed. Wood is a natural material that people are familiar with; it connects to the environment outside the hospital. Wood provides a warmer environment for patients, a place that family and friends look forward to visiting, and a place where staff feel secure and content. The beneficial effect of wood surroundings on the well-being of building occupants is borne out by recent research (<http://hdl.handle.net/2429/28644>).

Second, North Bay is located just north of Algonquin Park amid Ontario's vast boreal forest. North Bay has a long association with forest management and the production of wood products. Thus, it made historical sense to bring local materials into the hospital design and provide a connection with materials local people know and appreciate. It should be added that the design and construction was under constant review by the Ontario Ministry of Health and Long Term Care. The use of wood did not inflate construction cost.

The following photos show examples of the major wood uses in the North Bay Regional Health Centre. In addition, the photographs in this case study provide evidence that readers can use to assess for themselves how well the design has provided a new look and feel for these hospitals.

Photo: John Minkowsky,
EBHW Architecture Inc.



“ We wanted to reinvent the look and feel of a hospital and wood played a significant part in softening and warming the North Bay health centre. ”

Brian Bertrand
Lead Architect



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North Bay Regional Health Centre

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1 The parking area is designed so that every public space has a straight-line approach to the Main East Entrance glulam canopy that is the focal point for the entrance and provides cover from rain and snow. The wood adds a warm and welcoming quality to the entrance and sets the tone for the entire hospital experience. The glulam members are protected with several coats of Sainsin stain.

2 The main entrance is spacious, bright and highlighted with structural and decorative wood uses. It provides a first impression that is very different from most other hospitals. The three-storey interconnected space following the entrance is the Main Street, which is flanked by massive glulam elements. Midway down the Main Street is a sun-filled rest area.

3 The wayfinding for the four patient pods reflects the four seasons, Spring-Tulips (shown at left), Summer- Sun, Fall-Leaf and Winter-Snowflake. Curved, open spaces filled with natural light and accents of structural and decorative wood differentiate this hospital from older institutions. The Main Street Corridors are lined with glulam columns. Wood wall panelling at intervals provides variety and connection with a material connected to the past, present and future of North Bay.

4 All patient rooms are sunlit. Wood doors, cabinetry and highlights soften the hospital experience and create a more home-like environment intended to reduce stress and facilitate healing. Multiple wood accents from headboard to headwall panel carry the theme throughout the patient areas.

5 The NBRHC is designed with the interests of patients, visitors and staff at the forefront. For the staff, the intent was to provide a pleasant and secure work environment with clear sightlines. An effort was made to make administration areas less institutional. Wood paneling, doors and trim were used extensively to brighten areas without sunlight.

6 The consistent use of wood colour for the cabinetry throughout the facility creates a unified feel. The wood grain and colour add visual interest and provide a non-institutional atmosphere.

7 The exposed heavy-timber structure and deck in this meeting area has a non-institutional flair. The team station at this lodge projects into the patient unit. The wood desk provides a welcoming focal point.

8 The structure of the RMHC gymnasium roof pays homage to the industrial and railway heritage of North Bay. The stylized connector plates and glulam rivets provide a more rustic feel compared to concealed connections used for the District Hospital. The rivet is the most economical and efficient fastener available for heavy timber construction in that the "small dowel" action engages finite "blocks" of wood and transfers loads in a much smaller surface area than do bolt and shear plate groups.

9 The wood columns located in public areas were coated with a water-based urethane to facilitate washing and infection control. Both the glulam and timber decking were factory-stained to provide a high degree of quality control and to reduce on-site labour and scaffolding costs. This also allowed full coating of surfaces that were to be mated and would not be accessible by a painter after installation.

10 The use of a glulam canopy at the other main entrance, the Main West Entrance, provides another entry focal point. The pavilion provides a meeting place for patients and visitors to the Regional Mental Health Centre. This space is also a training space where patients can learn and re-learn basic skills such as shopping and banking. Doors to the exercise room (seen at the right of the photo) can be slid back to create a large, combined space for special functions.

11 The horticultural centre is used for patient therapy. Heavy timbers are ideally suited for this environment that can have up to 80% relative humidity.

12 Tied frames and purlins were used to create the home-like setting desired by the client for the Regional Mental Health Centre "cottages." The tied frame configuration is a very efficient wood application because it makes effective use of wood members in compression. The trusses were too large to be shipped but were made as simple as possible to allow very rapid site assembly and installation.

1 to **11** photos by Ed Eng, www.edeng.net, **12** photo by Sarah Hicks

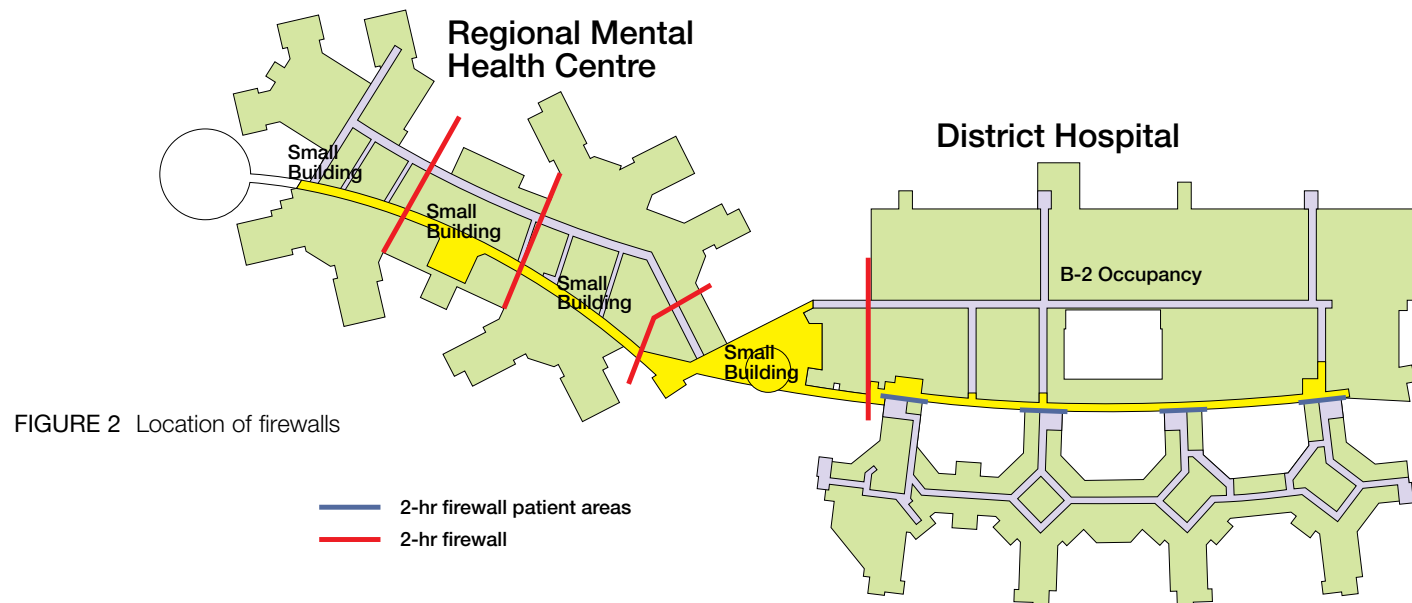
Fire Safety

The North Bay Regional Health Centre was designed according to the Ontario Building Code requirements for a care and treatment facility (3.2.2.38., Group B, Division 2). Except for allowable use for heavy timber construction in roofs of buildings 2 storeys or less in building height, structural elements within such institutional occupancies are required to be of noncombustible construction. Discussions were held with the architect, the architect's code consultant and Office of the Fire Marshal to evaluate alternative solutions.

As a result, several fire safety alternatives were approved based on special provisions. For example, the complex was broken into smaller buildings through the use of 2-hour firewalls (Figure 2). These firewalls were considered cost neutral because they were already required to fulfill other design objectives. In other cases, where areas of the facility are under 24-hour supervision and have additional sprinkler coverage, additional alternative solutions were approved.

In the case of the Main East Entrance Canopy (Figure 3), wood construction was permitted based on the following:

- the heavy timber structure was designed so that its possible failure would not affect the adjacent building structure and there are no intervening floor assemblies between the floor and the roof in the area with the heavy timber elements;
- the adjacent exterior wall has a 2-hour fire-resistance rating;
- the sprinkler design (dry system) provides higher-than-normal coverage and there is a low fire load in the area;
- the area is very public and any incipient fire or mischief is expected to be very readily detected; and,
- the area is immediately accessible to firefighter access from the exterior.



Heavy timber wood columns grace the south side of the lobby area and along the Main Street corridors. The lobby is spanned by heavy timber elements that support a heavy timber deck. This space has no floor assemblies between the main level floor and the roof and is detailed so that its collapse due to a fire would not affect the structure of the adjacent building.

The structural timber supplier worked closely with the mechanical sub-trades to provide factory-drilled holes for sprinklers through the Main Street glulam sections. This coordination saved a lot of site work, and created a very clean integration of the piping and glulam structure.

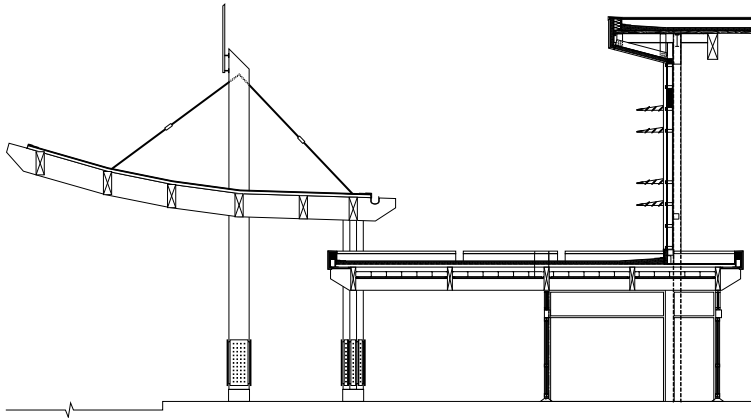


FIGURE 3
Section through Main East Entrance Canopy

In addition to protection provided by the stain finish and roof, critical connection areas of the entrance canopies were protected by the installation of solid boron rods. The rods protect the wood from decay in the event that moisture content increases.



Photo: Sarah Hicks



Photo: Ed Eng, www.edeng.net

More Reasons for Using Wood

The United Nations' Intergovernmental Panel on Climate Change deems buildings to be the greatest opportunity for making considerable reductions in carbon dioxide emissions. Using sustainably-harvested wood as a construction material is a simple and cost-effective step in this direction. By using wood from Canada's vast area of certified forest, the North Bay Regional Health Centre reduced its environmental footprint while providing superior architectural appeal and function.

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.¹

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 (Figure 4). 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 forest is harvested each year, and by law all public lands that are harvested must be successfully regenerated.²

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.²

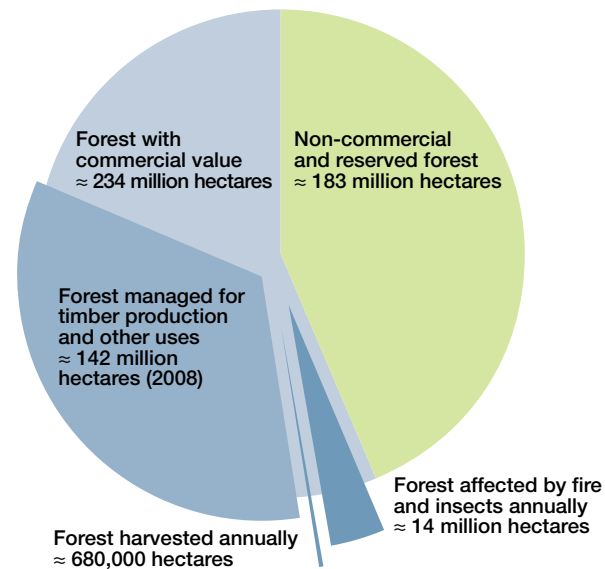


FIGURE 4 Status of Canada's 400 million hectares of forest³

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 concerns. No other construction material has the same rigorous review of its extractive processes as wood.² 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.¹

All of the laminating stock for the glulam used in the North Bay Regional Health Centre was sustainably harvested, certified to the CSA Z809 standard.

1. www.certification.canada.org

2. Canada Wood. Renewable by Nature. Sustainable by Design.

3. The State of Canada's Forests, NRCan, 2010.



Conclusion

The North Bay Regional Health Centre is a new model for health care in Canada. The design includes several innovations intended to de-institutionalize the character of the facility and create a more benevolent and healing atmosphere. One of the methods used to soften and personalize the buildings was to use exposed structural wood, wood panelling and cabinetry. Wood is a construction material that has a low life-cycle footprint and using certified wood from Canada's managed forests is a sound environmental choice. Modern methods make it easy to design, fabricate and install complex architectural concepts. As the photos in this case study indicate, the result is a facility that is inviting and bright. The North Bay Regional Health Centre indeed sets a new standard for health care delivery.

Photo: Ed Eng, www.edeng.net



Photo: Sarah Hicks

Project Team

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Photo: Kathy Stackelberg, NBRHC Public Relations Department

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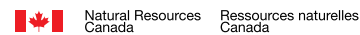


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