Angus Glen

COMMUNITY CENTRE AND LIBRARY

MARKHAM, ONTARIO

Canadian Wood Council / Conseil canadien du bois

WOODWORKS! Project of the Canadian Wood Council

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Introduction

Situated adjacent to Toronto, Markham, Ontario is a fast-growing community with a burgeoning need for recreational facilities. To help meet this demand, the Angus Glen Community Centre and Library was designed to provide a first-class recreational experience for one area of Markham.

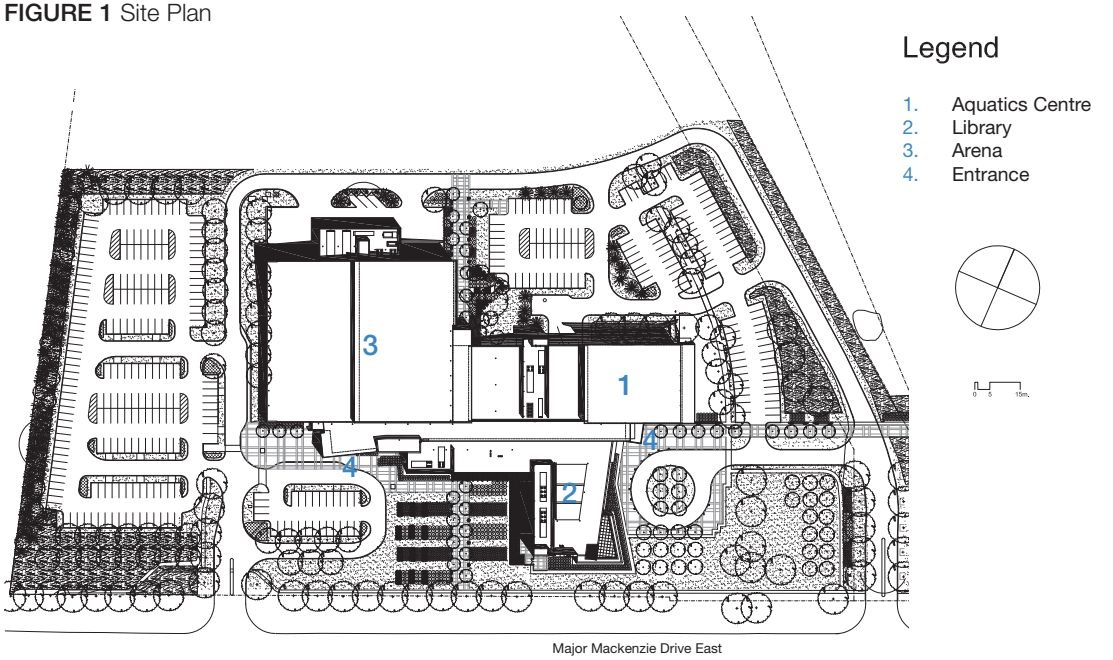
The centre is situated on a 6.5 hectare (16 acre) site (**Figure 1**) and includes two skating rinks, a gymnasium, an Aquatics Centre, change rooms, multi-purpose rooms, and a district Library.

The building has been enthusiastically endorsed by the public, with huge demand for the various swimming programs, hockey leagues and community clubs. In its first year, the building attracted 1.2 million visitors with demand for all activities far exceeding initial projections.

The Library is but one example of this success, breaking all records for Library visits in Markham with an average 11,000 users per week.

Much of the architectural appeal of the centre can be attributed to the use of wood as the key structural material in the Aquatics Centre, Library, the main entrances and 'main street' corridors, and decoratively in several other locations. The glued-laminated (glulam) roof structure, especially the one in the Aquatics Centre, has resulted in numerous inquiries from passers-by and visiting municipal officials interested in replicating the success of the Angus Glen Community Centre and Library in their own municipalities.

FIGURE 1 Site Plan

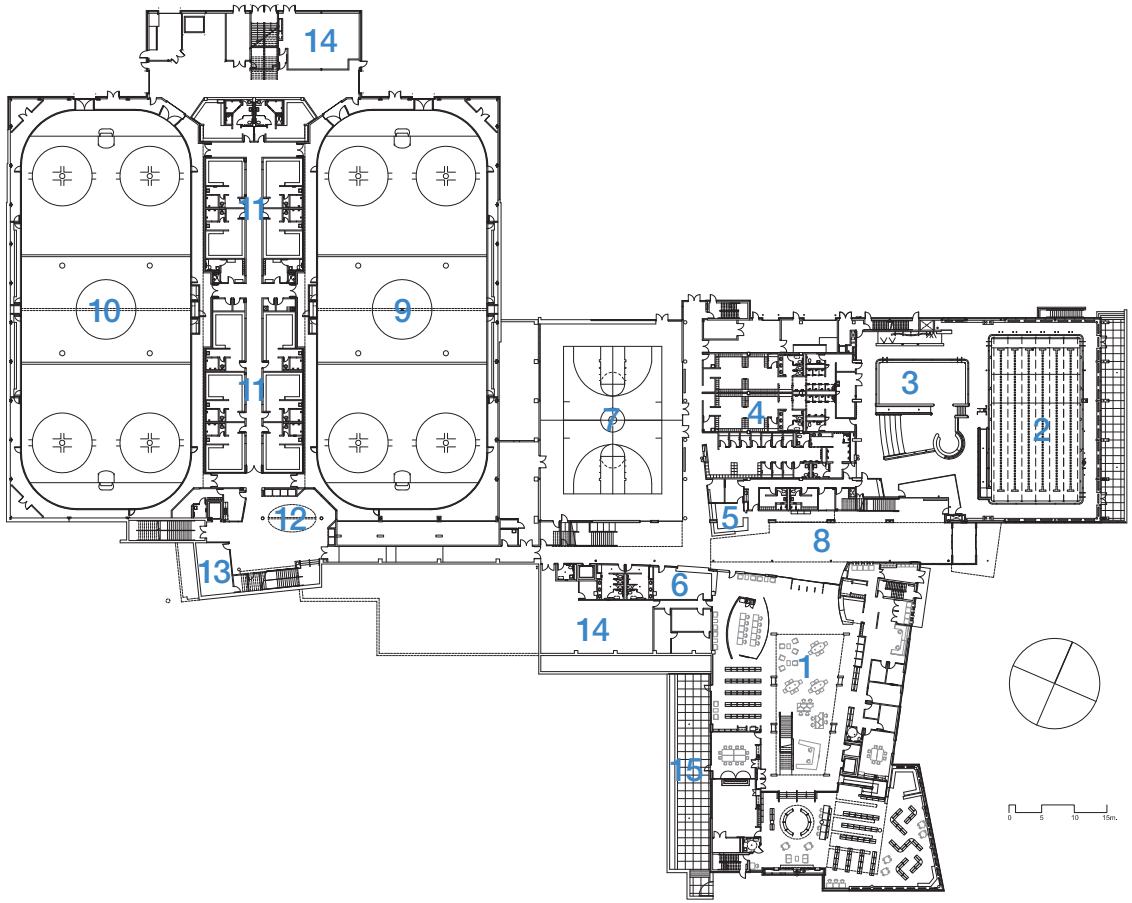


Building Description

A key objective of the building was to compliment the surrounding landscape, including an adjacent golf course, in terms of building volume, expression and materials. Wood played a key role tackling this objective and was utilized in the roof construction of the Aquatics Centre and Library, and throughout the main common spaces. Large overhanging roof elements and canopies soften the edges of the building and offer a visual attraction both inside and outside the centre.

The skating rinks, swimming pools, change rooms, gymnasium and multi-purpose areas provide a net floor area of approximately 13,470 m^2 (145,000 $ft.^2$) (**Figure 2**). The east and west entrances are connected with a long corridor that provides easy access to the main attractions and invites views into the various active spaces of the facility. The Aquatics Centre is comprised of a 6-lane, 25m swimming pool, a leisure pool, a splash pad and associated change rooms and offices.

FIGURE 2 Floor plan



Legend

1. Library
2. Swimming pool
3. Leisure pool
4. Change rooms
5. Reception
6. Cafe
7. Gymnasium
8. Lobby
9. Rink #1
10. Rink #2
11. Arena change rooms
12. Player's lobby
13. Pro shop
14. Mechanical room
15. Terrace

> We design several pools a year. There are so many advantages to using wood. For one thing, the thermal properties of wood facilitated extending the structure through the building envelope, which provides additional architectural freedom.

Duff Balmer
Shore Tilbe Irwin & Partners

In addition to wood's strength and natural beauty, its thermal properties made it easier to extend the structure through the building envelope to form large roof overhangs and canopies at certain locations. As noted by design architect Duff Balmer "We design several pools a year. There are so many advantages to using wood. For one thing, the thermal properties of wood facilitated extending the structure through the building envelope, which provides additional architectural freedom."

Visitors to the Library are greeted by an open, inviting entrance. Unlike most libraries, the main circulation desk is located to one side to make room for a large display area, lounge space and café. The Library includes a large information playground for children with reading nooks and a floating fibre-optic ceiling depicting the northern night sky, a dedicated teen area, fireplace lounge spaces, outdoor reading terraces, and multi-media areas.

Like the Aquatics Centre, the Library has exposed glulam beams in the roof structure and tongue-and-groove decking adds accenting around the skylight monitors. Large porch elements for the Library's reading terrace and community rooms, constructed from heavy Douglas fir timber beams and cedar slats, create generous transitional spaces around the building. Maple and cherry veneer plywood panels accent walls and ceilings, maple hardwood flooring is used in the main fireplace lounge, and maple veneer plywood is used for the information, reception and study desks, and shelving end gables.

The structure of the 'main street' corridors and common spaces consists of glulam beams, purlins and tongue-and-groove decking. Maple veneer plywood millwork and panelling accents the reception desks.

In areas of the building where wood is not the main structural material, wood was used to create focus points and accents. Maple and cherry veneer paneling was used extensively throughout the facility for wall and ceiling finishes, creating a strong design theme while also providing the necessary durability required in this type of building. The gymnasium has a solid maple sprung hardwood flooring and solid maple wood slat acoustic wall panels.

Structure and Durability

The Aquatics Centre roof is comprised of 38 mm Spruce-Pine-Fir tongue-and-groove decking supported by Spruce-Pine glulam beams and steel columns (**Figure 3**). The beams are up to 22.2 m (73 ft.) long and the maximum cross-section is 356 x 1102 mm (14 x 43-1/2 in.). The central support columns are 203 x 203 mm (8 x 8 in.) hollow steel sections.

The ambient conditions in swimming pool enclosures are very challenging for building materials for two reasons. First, the chemicals required to maintain hygiene in swimming pools are corrosive to many materials. Second, if uncontrolled, the humidity level can be very high.

The glulam was shop coated with one coat of shop sealer and one coat of zinc napthenate was applied to exposed ends. The shop sealer was applied to all the glulam used in the Angus Glen Community Centre and Library to retard drying and reduce checking. The sealer also provides a pleasing appearance and protection against streaking or staining. This was the main benefit for the Aquatic Centre glulam where the humid environment diminishes the need to limit drying stresses. The wood decking was dip treated in zinc naphenate.

Chlorine-based chemicals result in the emission of chloramines that are corrosive to some materials. Even stainless steel is susceptible and care is required to select the appropriate grade for a swimming pool environment. The presence of chloramines is increased in modern swimming pools due to higher water temperatures and water slides or sprays that tend to increase humidity and the release of chloramines.

Wood is not affected by swimming pool water purification chemicals and for this reason, structural wood products like the glulam used in the Aquatic Centre at the Angus Glen Community Centre are an appropriate choice.

The air quality management strategy for swimming pool enclosures needs to control the relative humidity both for occupant comfort and to reduce condensation and high humidity that is damaging to many building materials and assemblies. Most modern swimming pools use mechanical dehumidification to manage moisture. The 2007 ASHRAE Handbook cites a deck-level relative humidity of 50-60% to fulfill these requirements. Because warm air rises, the relative humidity will be somewhat higher at the roof level.

At roof-level relative humidities below 80%, wood products will remain well below the moisture content that would initiate decay or mould growth (**Figure 4**). In fact, at a relative humidity of 75% and a temperature of 21ºC (70ºF), the equilibrium moisture content (EMC) of glulam will remain at about 15%, its approximate moisture content at the time of manufacture. In the case of the Angus Glen Community Centre, mechanical dehumidification keeps the relative humidity below this level.

Details were developed to provide air-sealing wherever glulam structural members pierced the envelope, especially given the high humidity in the swimming pool enclosure. In addition, the HVAC system was designed to provide a lower pressure in the Aquatics Centre so that any air leakage would be from the exterior to the interior.

FIGURE 4

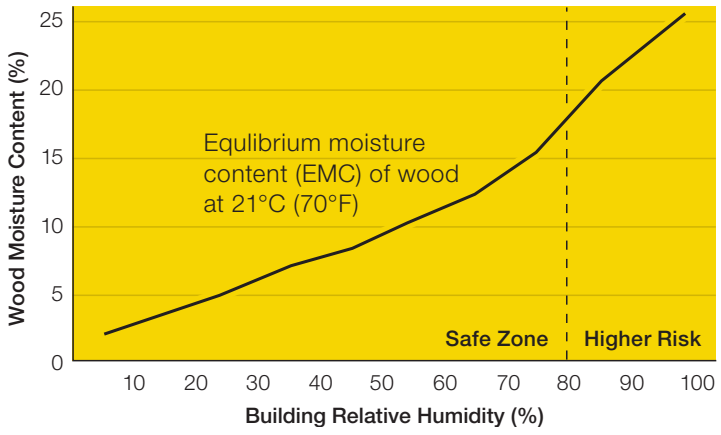
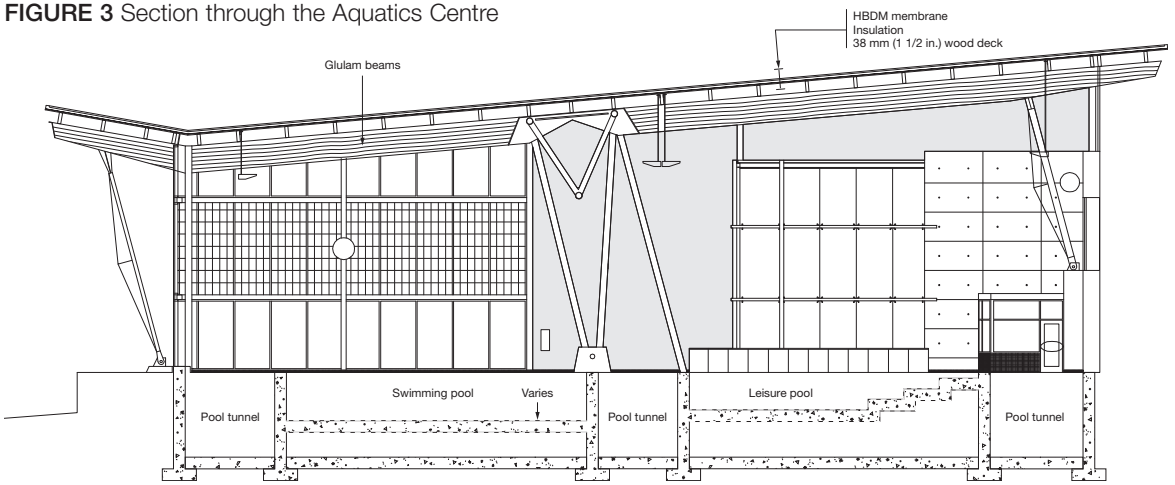


FIGURE 3 Section through the Aquatics Centre



Sustainable Design

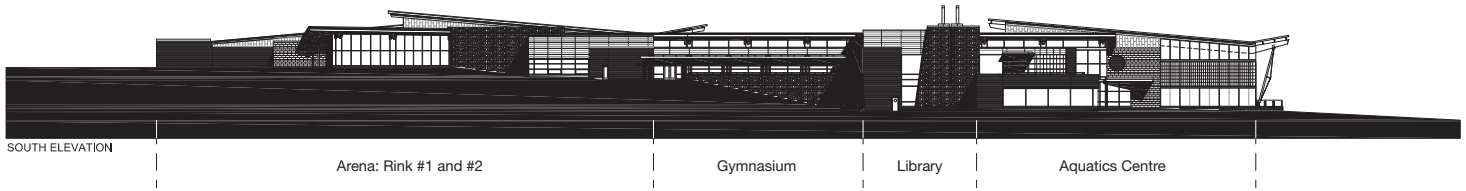
Although official certification was not sought, the Angus Glen Community Centre and Library was designed to meet client expectations for a low environmental footprint. From the outset, it was intended to use the sloping site to advantage. In the case of the arena, the topography was used to partially bury this element and use the thermal mass of the earth to reduce heat transfer (**Figure 5**).

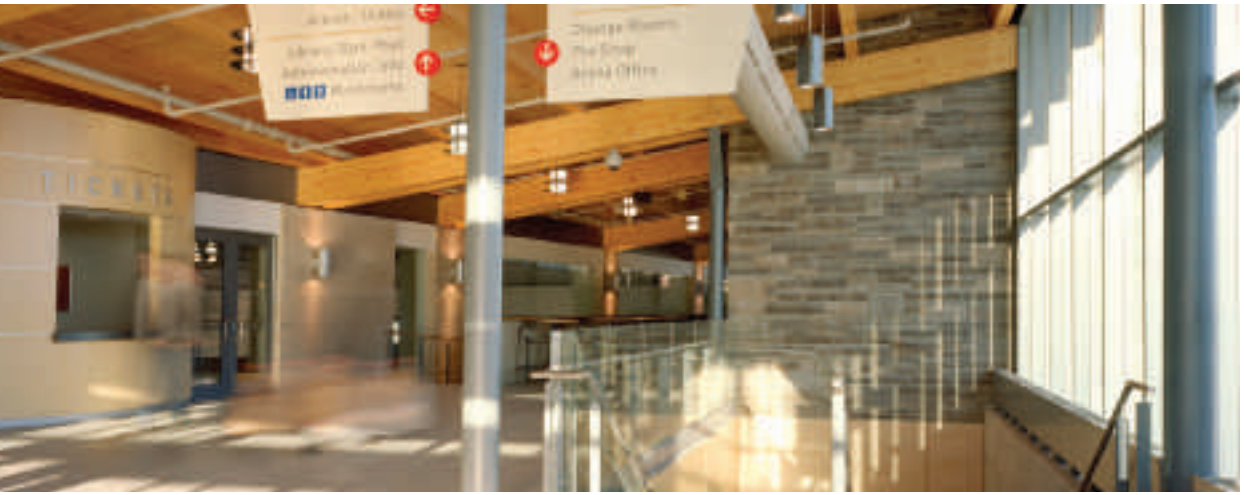
The site storm water management was achieved through a series of tiered settling ponds that reduce the load on the municipal sewers, and create an attractive wetlands zone, which is developed in conjunction with sitting areas and trails.

The building has large areas of glazing in combination with translucent panels, window shades, bris-soleils and baffles to maximize the day-lighting into the building, while controlling glare into the more sensitive areas such as the Aquatics Centre and Library. This not only creates pleasant spaces, but also significantly reduces the need for daytime lighting.

Finally, the use of wood was an important factor in meeting the client's desire to acquire a building with a low environmental footprint. Taking advantage of Canada's world leading forest certification (CSA, FSC, SFI) and management practices, wood products natural attributes outperform other building materials. Life Cycle Assessment (LCA) like Athena (www.athenasmi.ca) demonstrate that wood has a lower environmental impact.

FIGURE 5 Elevation view of the Angus Glen Community Centre





Fire Safety Requirements

The Aquatics Centre is classified as Group A, Division 3 (Ontario Building Code 2006). The Angus Glen Community Centre is sprinklered throughout and therefore the building area is limited to 12,000 m^2 when the building is 1 storey in height (OBC 2006, Article 3.2.2.31.). Regardless of building area or type of construction required, the roof assembly is permitted to be heavy timber (glulam and wood decking) for buildings up to two storeys in height that are sprinklered throughout (OBC 2006, Article 3.2.2.16.).

The Library, gymnasium, and multi-purpose rooms are classified as Group A, Division 2, up to six storeys, any area, non-combustible construction, and sprinklered (OBC 2006, Article 3.2.2.24.).

In other areas of the building classified as non-combustible construction, wood panel finishes are used extensively for appearance. Wood finishes are permitted provided they are not more than 25 mm (1 in.) thick and have a flame spread rating of not more than 150.

Conclusions

The Angus Glen Community Centre and Library has been a tremendous success for the Town of Markham. The recreation complex uses a variety of structural and decorative wood materials to create a welcoming, attractive atmosphere as demonstrated by the photographs.

Glulam and other structural wood products are frequently used in recreation and aquatic facilities, both for their appearance and their performance. Glulam has been used successfully in many swimming pool enclosures. It provides a unique architectural attraction and it is resistant to the chemical corrosion prevalent in pool buildings.

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