



Rock Community Church

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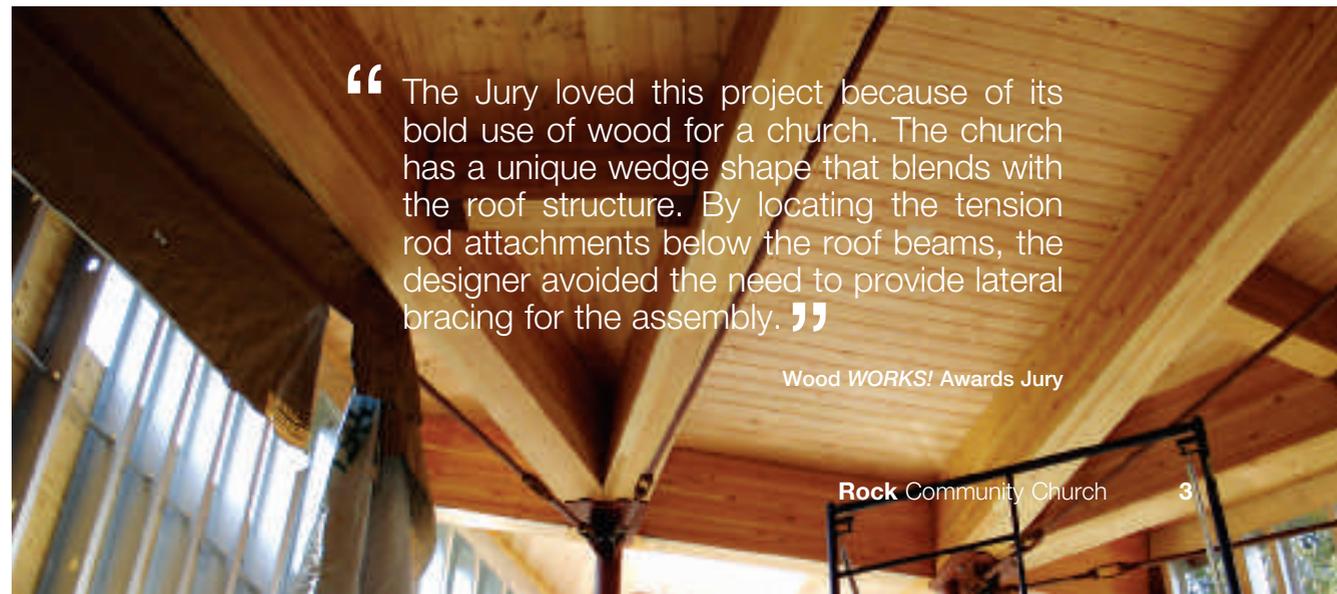
Introduction

Rock Community Church is located in Woodbridge, Ontario, directly north of Toronto. Several years ago, the congregation bought a large, wooded property and used an existing residence and outbuildings for their needs while funding was acquired and design was developed for a permanent facility. Designed to incorporate a detailed list of user requirements, the new building was ready for occupancy in October 2007. There are two particularly noteworthy features of this building. One is the way it was designed to suit the site and second is the modular design that will allow the building to expand as the size of the congregation grows.

The Rock Community Church design carefully uses structural and decorative wood products to blend with a beautiful natural setting and to provide architectural appeal and acoustical performance inside. The 2.2-hectare (5.4 acre) site (Figure 1) falls within the Woodbridge conservation area. To respect the natural setting, the design focused on creating an environmentally-friendly building site that would harmonize with its surroundings. All site elements, including the building and the parking lot, were carefully located to save existing trees and fit the site topography. The neighbouring deciduous trees provide shading from summer sun and allow the entry of winter solar heat through the floor-to-ceiling glazing in the altar area of the sanctuary.

This project was the winner of the **Ontario Wood WORKS! Awards – Jury's Choice in 2008.**

FIGURE 1 Site Plan



“ The Jury loved this project because of its bold use of wood for a church. The church has a unique wedge shape that blends with the roof structure. By locating the tension rod attachments below the roof beams, the designer avoided the need to provide lateral bracing for the assembly. ”

Wood WORKS! Awards Jury

Building Description

The present building consists of two pie-shaped segments. The main floor is the sanctuary (Figure 2) and the basement is comprised of a main hall, kitchen, meeting and class rooms, mechanical and electrical rooms and washrooms. Figure 3 shows a section through the building.

The sanctuary holds 300 removable seats and has a maximum capacity of 350 people. The moveable seating makes the space easy to adapt for different types of functions. The sanctuary is entirely glazed at its apex, which naturally draws attention from the church attendees toward the altar. The floor is finished with 19 mm (3/4 in.) wood flooring affixed to the concrete slab with Nadurra® 'VOC-free' adhesive. After two heating seasons, the adhesion is completely problem-free. The sanctuary is used regularly for musical performances and the wood roof (see Structure) provides excellent acoustics.

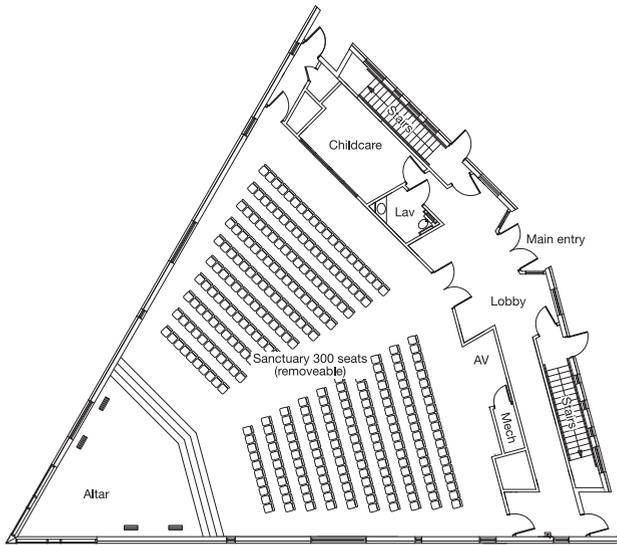


FIGURE 2 Main floor plan

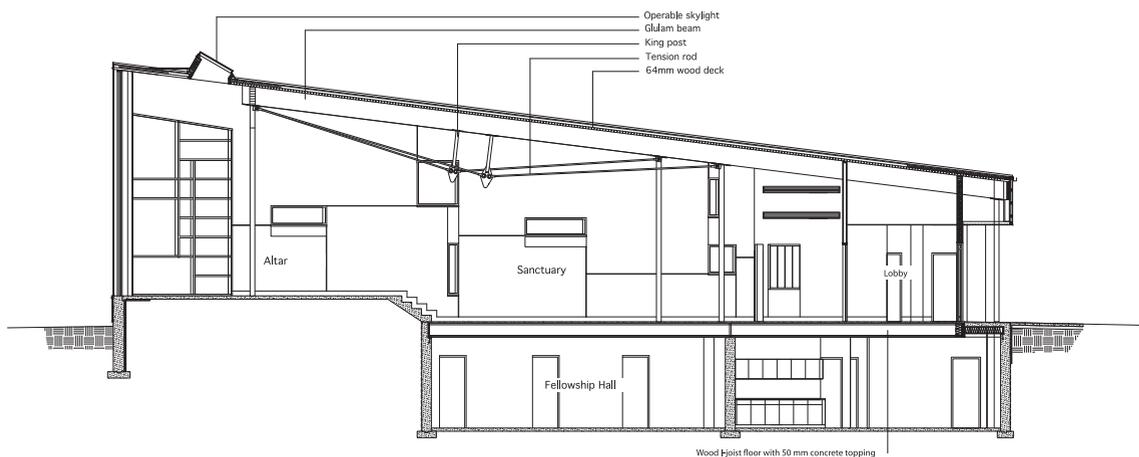


FIGURE 3 Section through the sanctuary and basement

The building exterior is clad with pre-finished wood panels and western red cedar siding. The cedar was coated with Cetol basecoat and finish coat. This finish system was selected for its ultra-violet protection, water repellence and breathability. The western red cedar siding is attached to horizontal wood furring strips fastened to the plywood sheathing and wall studs, creating a rainscreen wall. The roof was designed to slope away from the south and was finished with a sun reflecting, galvanized sheet metal roofing material to minimize heat gain during the summer.

The building, both inside and out, has received a very high appreciation rating from members and visitors. As architect C.Y. Lee stated in his competition entry:

“Wood was used extensively for the project because it is sustainable, natural, environmentally friendly, durable, strong but flexible, and most importantly, beautiful. The exposed wood structure makes the building a warm and inviting place. The cedar siding on the exterior walls blends beautifully into the densely-wooded site. The solid mahogany entrance doors and the hardwood flooring provide a welcoming and positive experience to church members and visitors.”

The use of wood accelerated the construction schedule. The architect noted that the wood beams and king posts were installed easily. The wood floor was fast to install and left the basement area free of falsework during floor construction. The wood siding was fast to install and provided rainscreen protection.

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C.Y. Lee, Architect

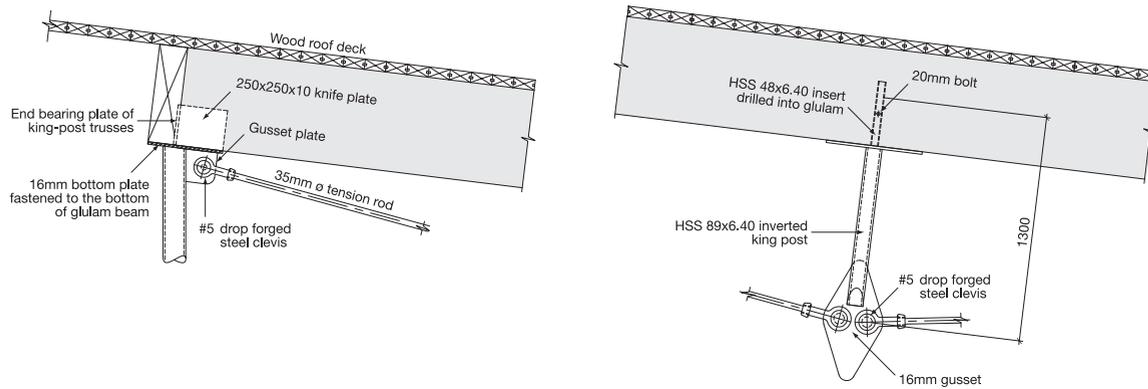




Structure

The roof structure is comprised of glulam beams supported by round steel columns. The 14.1 m (46 ft.) span of the glulam beams is supported by tension rods and king posts (Figure 4). The heavy timber roof assembly is comprised of 265 x 608 mm (10-½ x 24 in.) glulam beams, which surpass the minimum size required to qualify as heavy timber construction. The glulam beams are covered with 64 mm (2-1/2 in.) tongue-and-groove solid-sawn plank wood decking, vapour barrier, 12.7 mm (1/2 in.) protection board combined with 76 mm (3 in.) polyisocyanurate rigid insulation, ice and water shield and prefinished (galvanized) metal roofing.

The glulam beams obtain intermediate support from king posts and steel tensioning tendons that allow a small reduction in the size of the beams and provide architectural appeal. The attachment points for the ends of the tension rods (lower chord) are below the working point of the glulam beam (upper chord). With this arrangement, the tension rods counteract lateral rotation of the king post and therefore, the king post does not need to be braced. The Douglas fir-larch glulam beams are finished with one coat of standard “heavy” sealer and two coats on the beam ends.



The floor over the basement is comprised of cross-braced 406 mm (16 in.) wood I-joists spaced on 305 mm (12 in.) centres. Due to the pie-shape of the building, the wood I-joists vary in length. The maximum span for single wood I-joists was 5.5 m (18 ft.). For larger spans, the I-joists were doubled. The wood I-joist floor in the sanctuary was designed for a live load of 2.4 kPa (50 psf) and a dead load of 2.1 kPa (44 psf). The I-joists are finished on the underside using 12.7 mm resilient metal channels spaced on 610 mm (24 in.) centres to attach a single layer of 15.9 mm (5/8 in.) fire-rated gypsum board, and

FIGURE 4 Tension rod and king post details

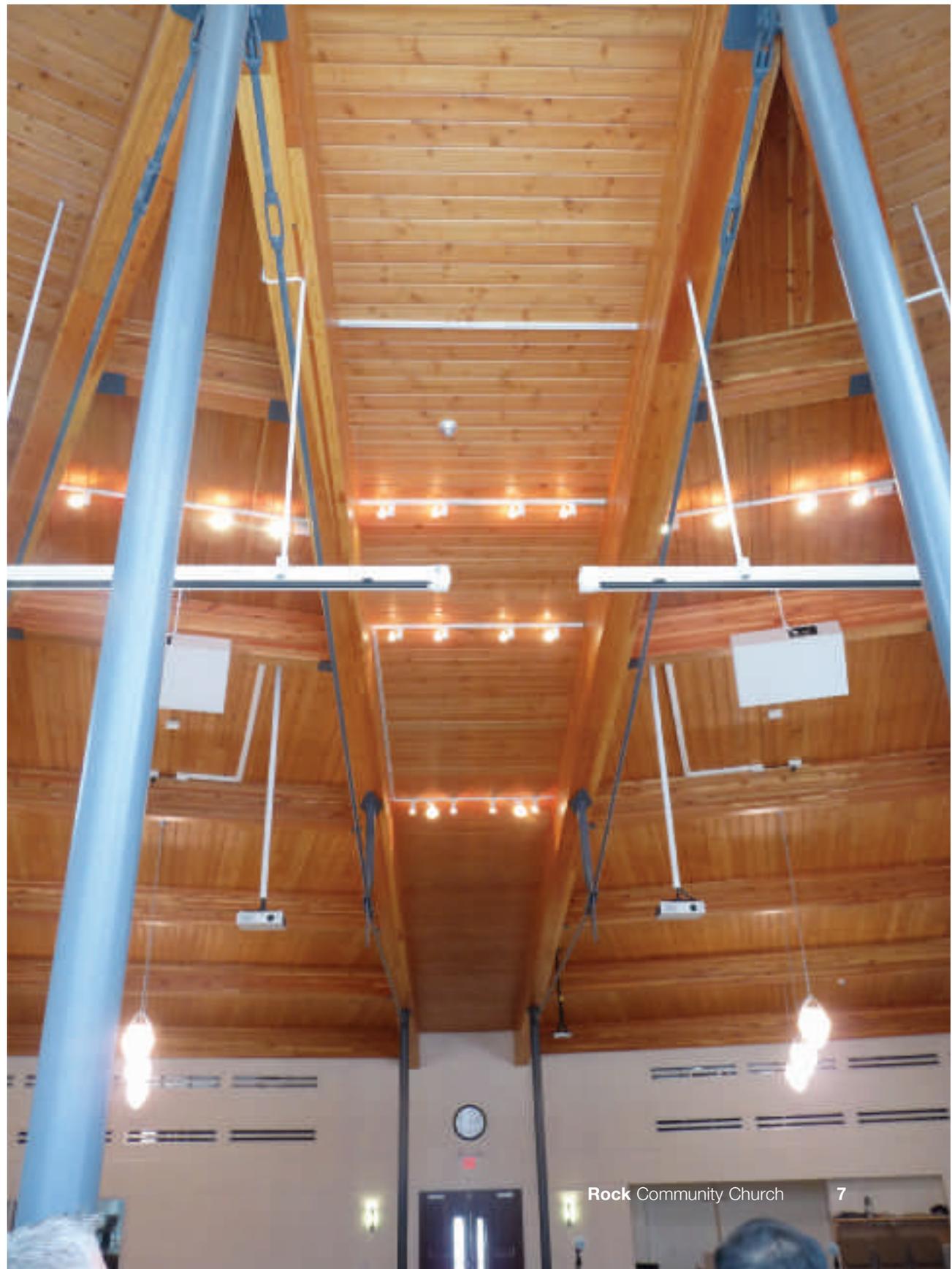
on the top with 19 mm (3/4 in.) tongue-and-groove plywood subflooring. A 50 mm (2 in.) concrete topping with one layer of 150 x150 mm (6 x 6 in.) welded wire mesh was placed over the subfloor and the prefinished wood flooring was glued to the concrete. The wood I-joist floor assembly provides a 1-hour fire-resistance rating and provides a very good level of sound isolation between the sanctuary and the rooms in the basement. The concrete-topped wood floor is very solid – for foot-fall traffic, there is no noticeable difference between the concrete slab floor in the altar area and the wood I-joist floor assembly in the remainder of the sanctuary.

Prior to specifying the wood roof, a preliminary cost estimate was done to compare to a steel roof. When all required fire protection and finishing was taken into account, the wood option proved to be the most cost-effective system. For the floor over the basement area, the wood I-joist floor was the most economical option and equaled or surpassed the performance of other systems considered.

Future Expansion

It is anticipated that the size of the congregation will grow appreciably in the coming years. The pie-shape segmental construction allows for the future addition of up to three more modules to the present two modules for a seating capacity of approximately 750 seats.

The exterior side walls are non-loadbearing. This means the building enlargement can take place with minimal disruption to the existing building with the wall separating the present and future sections being removed once construction is far advanced, and the materials reused. When expansion does occur, the existing altar area remains where it is and is widened. The view lines in the sanctuary take into account both present and future arrangements.



Fire Safety Requirements

Rock Community Church was designed based on the 2006 Ontario Building Code requirements for a Major Occupancy classified as a Group A-Division 2 assembly occupancy. For such an occupancy, a building that is facing two streets, is unsprinklered and of combustible construction providing a fire-resistance rating of not less than 45 minutes, a 1-storey building can have a maximum building area of 2,000 m². At the current building area of 725 m², the building falls well within the maximum area allowed and will also fall under the maximum if and when expansion to the five modules and 1,800 m² occurs.

The building has a fire alarm system and an adequate municipal water supply. The wood I-joist floor assembly has a fire resistance rating of 1 hour – more than the 45-minute requirement. The glulam beams and thick wood roof decking qualifies as heavy timber construction, which is permitted for buildings required to have a 45 minute fire rating.

Sound Transmission

The church required a very high standard of sound transmission class (STC) to allow functions to occur simultaneously in the sanctuary on the main floor and in the meeting area and rooms in the basement without the noise from one function disturbing the other. The wood I-joist floor assembly, with its 50 mm (2 in.) concrete topping, resilient metal channels spaced at 24 in. (605 mm) centres and 15.9 mm (5/8 in.) fire-rated gypsum board ceiling below the floor assembly achieves a sound transmission class (STC) of 59 in accordance with the Ontario Building Code Supplementary Standard SB-3.



Heating and Cooling

The site is located just beyond the availability of natural gas and therefore heating is provided by means of high-efficiency electric furnaces with a timer control. Heat delivery and cold air intake is provided at the rear of the sanctuary. The arrangement provides even heating and there is no noticeable draft in the room.

Central air conditioning is provided but natural ventilation is used as much as possible. Strategically-located operable windows admit fresh air when conditions are right. A large skylight located at the high point of the roof opens by remote control to provide ventilation. The large windows allow solar heat to enter in winter and screening by deciduous trees blocks summer sunshine from heating the sanctuary.





Conclusion

Rock Community Church was carefully designed to meet site and financial realities. The present building is comprised of two, pie-shaped segments, a layout that was intentionally selected to easily allow for future expansion of the building up to a maximum of five segments. Wood was used for the roof and floor over the basement to minimize cost and provide a superior architectural appearance due to the exposed glulam beams and wood deck roof.

Structural and decorative wood products were used to give the Rock Community Church a warm welcoming interior and an exterior that blends with the wooded, rural site. A floor system incorporating wood I-joists, plywood subflooring and concrete topping combine to provide a heavy-duty floor system over the basement area. Western red cedar was used for cladding the exterior.



Project Team

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