Administration and Training Facility

Alberta Boilers Safety Association

The pressure equipment safety authority

Canadian Wood Council
Conseil canadien du bois

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The Alberta Boilers Safety Association (ABSA) is responsible for the safe design and operation of boilers, pressure vessels and pressure piping systems in Alberta. After more than a century of service, the ABSA needed additional space for its training and certification responsibilities.

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In 2004, the ABSA Building Committee was activated to develop user requirements and to guide the planning, construction and commissioning of a new facility. The Committee and the architect (Manasc Isaac Architects) met several times to identify and determine building requirements and design options that met the following design objectives:

- Provide an attractive, affordable building that reflects ABSA's core values and business;
- Design a workspace that is a source of pride for staff and welcoming for visitors;
- Design a building that exceeds code requirements for energy and environmental design. Specifically, the objective was to construct a building with energy performance twice as good as conventional buildings of comparable size; and
- Maximize natural lighting and provide an operable window system.

This case study demonstrates beauty, strength and interior comfort associated with using wood or engineered wood products in construction. Furthermore, the project demonstrated the ease of design and erection associated with timber frame construction. Last and most importantly, this case study demonstrates that LEED Silver standard can still be attained by a wood constructed building without the use of Forest Stewardship Certified (FSC) wood products.

The new ABSA facility is located in Edmonton's Research Park (Figure 1), joining 35 other technology companies and agencies. To accommodate staff and increased visitor traffic, the new ABSA facility has 51 parking spaces on the site and another 49 in the parkade below the building.

Completed in May 2006, the ABSA facility utilizes glulam beams and columns to achieve the Building Committee's design objectives for aesthetics, lighting, energy and environment.

Building Description

Situated in Edmonton's Research Park, the building is oriented in an east-west direction to maximize sunlight and natural ventilation. The building is anchored by a main corridor that acts as an interior

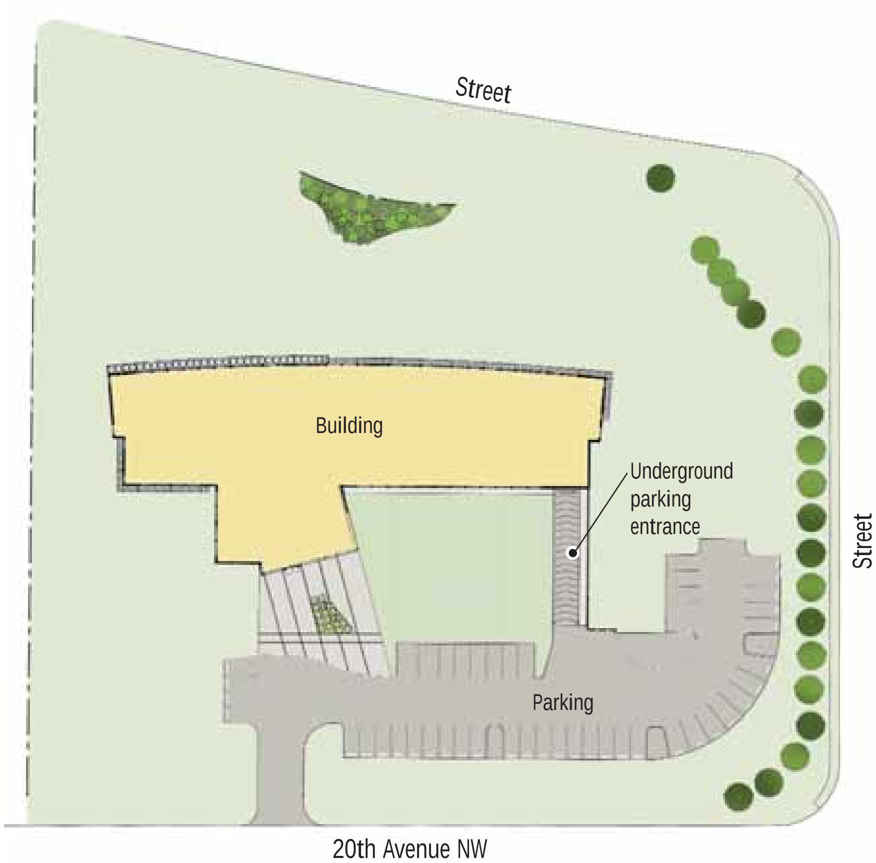


FIGURE 1 Site plan

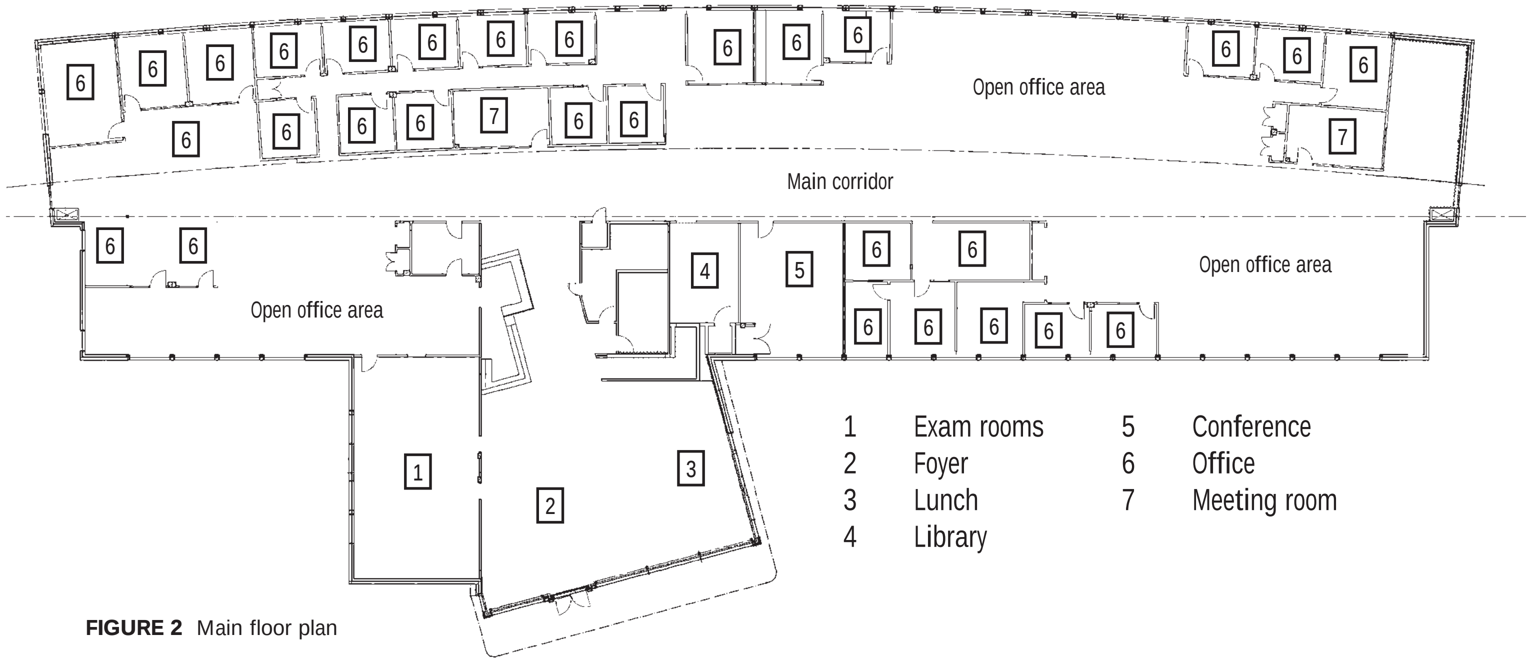


FIGURE 2 Main floor plan

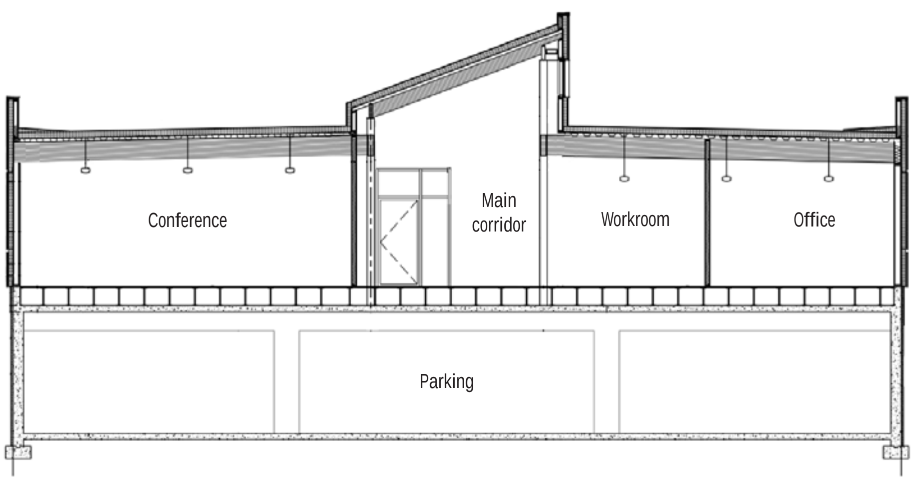


FIGURE 3 Cross-section (looking west)

'street' (Figure 2), designed to facilitate easy interaction between departments. There are two main areas to the building: one for Accounting and Administration and the other for Design Review, Training and Certification. The interior corridor of the ABSA building is one-story with a clerestory extending along its length. The area of the facility is 2,040 m^2 (21,950 $ft.^2$).

The facility maximizes natural light and exterior views for each office. The windows are operable to control temperature and air quality. Clerestory lighting is used to provide natural light to the main corridor. Both the North and South blocks have been designed to facilitate enlargement of the facility, should it be required.

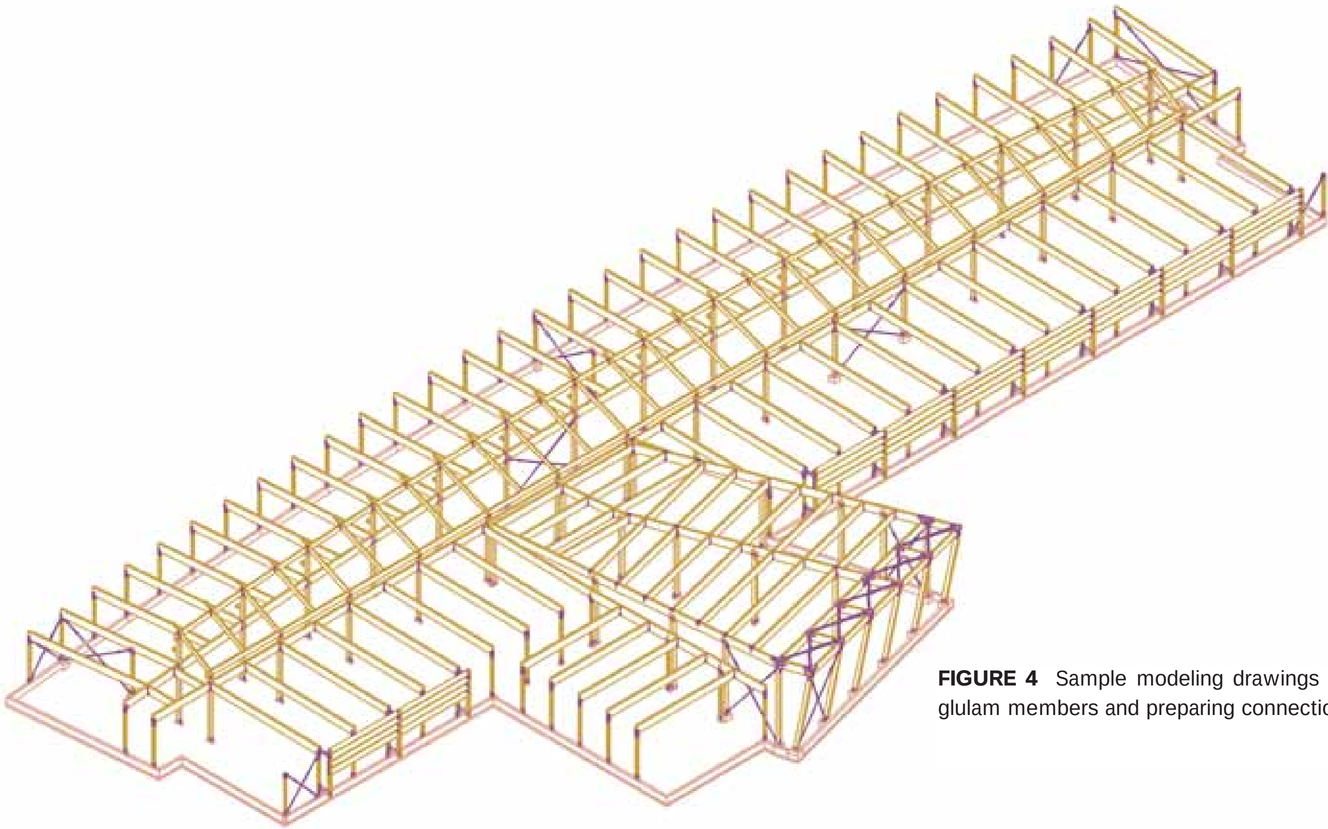
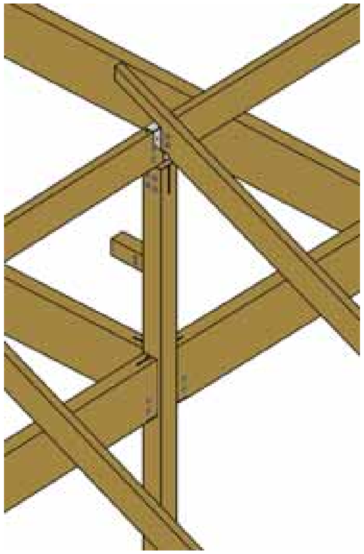


FIGURE 4 Sample modeling drawings for cutting glulam members and preparing connections



Structure

The ABSA facility combines glulam post and beam construction for structure, and plywood and wood-frame shearwalls to provide lateral stability.

A glulam structural system was selected because it best suited the Building Committee's desire to create a warm, welcoming work environment. It also met their requirement that "the architectural team select materials that convey a sense of permanence while respecting the nature of ABSA's client base." Unlike many buildings that make use of glulam only in high-visibility areas where appearance is important, it was used throughout the facility. As the architect Myron Nebozuk notes, "The glulam warms the building. It reflects and diffuses a soft light from the clerestory windows to the workspaces below."

Edmonton-based glulam manufacturer Western Archrib used their three-dimensional software and machinery to model all the members, make the appropriate cuts, and prepare the connections (Figure 4). On the recommendation of the glulam supplier, the general contractor engaged a sub-contractor to erect the wood-framing and the glulam. New to working with glulam, the site superintendent, Terry Fair, was pleasantly surprised at how easily the superstructure went together on time and on budget. "The clerestory was built on a curve and every roof joist framing into the clerestory had a different length and a different cut angle. The software and cutting machine used by Western Archrib resulted in every piece and connection fitting together without site modification."

The roof system is metal supported by metal decking and glulam beams. Although some perimeter angle iron was welded to the steel decking, the central part of the decking was attached to the glulam support system by screwing through the steel decking. The clerestory is framed with metal decking and glulam beams. Since the clerestory naturally results in snow drifting on the lower roof levels, heavier gauges of metal roof decking were used to carry additional loads.

Finishes

The ABSA Building Committee desired materials that convey a sense of permanence. Exterior walls are finished with metal cladding. At the main entrance, masonry and riveted metal siding is used to convey a sense of ABSA's pressure vessel business and heritage. The window frames are clear aluminium. The glazing on the south side is tinted and the glazing on the north side is clear. The materials used for interior finishes were selected for their low volatile organic compound-emitting characteristics. The majority of the main floor has an access floor system to facilitate the relocation of cables. Removable carpet tiles are used for the floor covering in this area.

Heating and Cooling

The design objective was to provide simple, local control for each occupant's space, and overall energy savings and efficiency.

In winter when windows are closed, make-up air is ducted to local fan coil units to provide a mixture of outside and recirculated air to all areas of the facility. The fan coil units, located in the raised access floor, provide heat (and mechanical cooling) to serve each zone. Operable windows provided natural ventilation.

Heating and ventilating is controlled with microprocessor technology by a direct digital control (DDC) energy management system achieving high efficiency. Primary heating is provided by a high efficiency condensing gas-fired boiler plant. The boiler provides heat for pipe distribution to heating coils located in the fan coil units.

An air-to-air heat recovery heat wheel is used to recover heat from exhaust air. Cool, dry, exhaust air enters one side of the rotating heat wheel, chilling the wheel and drying the desiccant coating. This cool and dry part of the wheel then rotates into the supply air where it absorbs heat and humidity from the incoming fresh air before the air is mechanically cooled to room temperature.

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The heat wheel can reduce the ventilation air-conditioning load by up to 90%, which saves energy and reduces the size of required air-conditioning equipment.

Building elements such as windows, shading and lighting were designed to reduce cooling loads. A central chiller provides additional cooling through a closed loop to a cooling coil located in the main air handling unit.

Fire Safety

The design was based on the Alberta Building Code 1997 (ABC) and the building was categorized as:

MAJOR OCCUPANCY:
Group D - Business and Personal Services
SUBSIDIARY OCCUPANCIES:
Group A- Division 2 - Assembly Occupancy
Group F- Division 3 - Storage Garage

The facility has sprinklers throughout in compliance with ABC requirements for this building size and occupancy. The use of sprinklers means glulam members (heavy timber) supporting the roof can be sized based on structural requirements alone rather than needing to be a minimum size to suit fire safety requirements – the codes recognize the ability of sprinklers to limit the severity of fire that might otherwise cause significant structural damage. Consequently, the load-bearing exterior wood-frame walls supporting the roof also are not required to be designed to provide a minimum fire resistance rating. Additional benefits arising from the use of sprinklers include a reduction in fire-fighting access, such that access to the building is required from only one face or side of the building.

A concrete floor assembly provides a 1-1/2 hour fire separation between the garage and the office area storey to meet the requirement for separating storage garages from occupied areas of a building. Although in this case a concrete floor was used, a wood floor was also an option, since wood floor assemblies can be constructed with fire resistance ratings up to two hours.

Environment and Energy

The ABSA Building Committee supported sustainable design and construction for their Administration and Training Facility. As a result, the architect employed an array of measures, products, components, and systems to achieve sustainable objectives.

The construction of the facility added a number of energy and environmental saving features and components such as:

- Solar shading
- Reduced lighting power density
- Increased wall insulation for building envelope
- Reduced fenestration U-valve
- High-energy mechanical equipment
- Motion detecting occupancy sensors for lighting and HVAC systems
- Heat recovery equipment
- Maximization of day lighting
- Low water use plumbing fixtures

The facility is oriented to maximize perimeter natural lighting. Clerestory windows add natural light to the main corridor area of the facility. Light shelves and shades are used to maximize lighting and reduce glare. The majority of workstations have access to natural lighting.

Successful application was made through the Commercial Building Incentive Program (CBIP). Administered by Natural Resources Canada's Office of Energy Efficiency, the CBIP encourages the design and construction of new, energy-efficient commercial, institutional and multi-unit residential buildings and facilities. It provides design assistance and funding of up to $60,000 for eligible organizations based on building energy savings. To qualify, buildings need to exhibit at least a 25% reduction in annual energy savings compared to the Model National Energy Code for Buildings (MNECB) minimum standards. The energy saving measures implemented in the ABSA building resulted in energy use projections 45% lower than MNECB minimum standards.

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The choice and use of glulam, an engineered wood product, in the wood frame construction of the ABSA building achieved several intrinsic environmental and energy design advantages. The cellular structure of the wood offers low conductivity and acts as a natural insulator by trapping air within its cell walls. The wood product/materials are biodegradable and recyclable. The application of wood-frame construction provides a low embodied energy[1]. If a comprehensive life-cycle assessment[2] (LCA) were performed, it would be possible to make a determination with respect to greenhouse gas emissions, airborne pollutants, water pollutants and embodied energy over the building's life.

Sustainable building design is closely linked with sustainable forest management practices, and sustainable forest management (SFM) certification systems. The three predominant forest management certification systems in Canada include Canada's National Sustainable Forest Management Standard (CAN/CSA-Z809), the Sustainable Forestry Initiative (SFI), and the Forest Stewardship Council (FSC). Currently, the Canada Green Building Council's LEED® Building Rating System (an adaptation of the US Green Building Councils Leadership in Energy and Environmental Design) only recognizes FSC certification. Despite the fact that greater than 50% of the wood materials used in the ABSA were certified under SFI or CSA, the building was still not eligible for the 1-point under LEED Credit 7 - Certified Wood.

1 *This is the sum of the energy required to extract, harvest, process, manufacture, transport, construct and maintain the products used in building applications.*

2 *LCA is a performance-based approach for assessing the impacts building choices have on the environment by quantifying the overall effects a product, process or activity has on the environment over its lifetime.*

Although the ABSA Administrative and Training Facility has not been audited for certification under the Canada Green Building Council's Leadership in Energy and Environmental Design (LEED)®, the architect, in consultation with ABSA, developed and designed the building to meet a LEED Silver® requirement (33 to 38 points).

Conclusion

The Alberta Boilers Safety Association Administrative and Training Facility demonstrates sustainable benefits associated with wood in terms of environmental and energy savings. In addition, the building exemplifies the ease of erecting a glulam post and beam frame and the construction ease of using wood materials in general. At the same time, this case study serves as a call for change in terms of how buildings are rated for sustainable design. Finally, this case study demonstrates how wood-frame construction can provide a bright warm work environment for employees, guests and clients.

WoodWORKS! is a Canadian Wood Council initiative

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