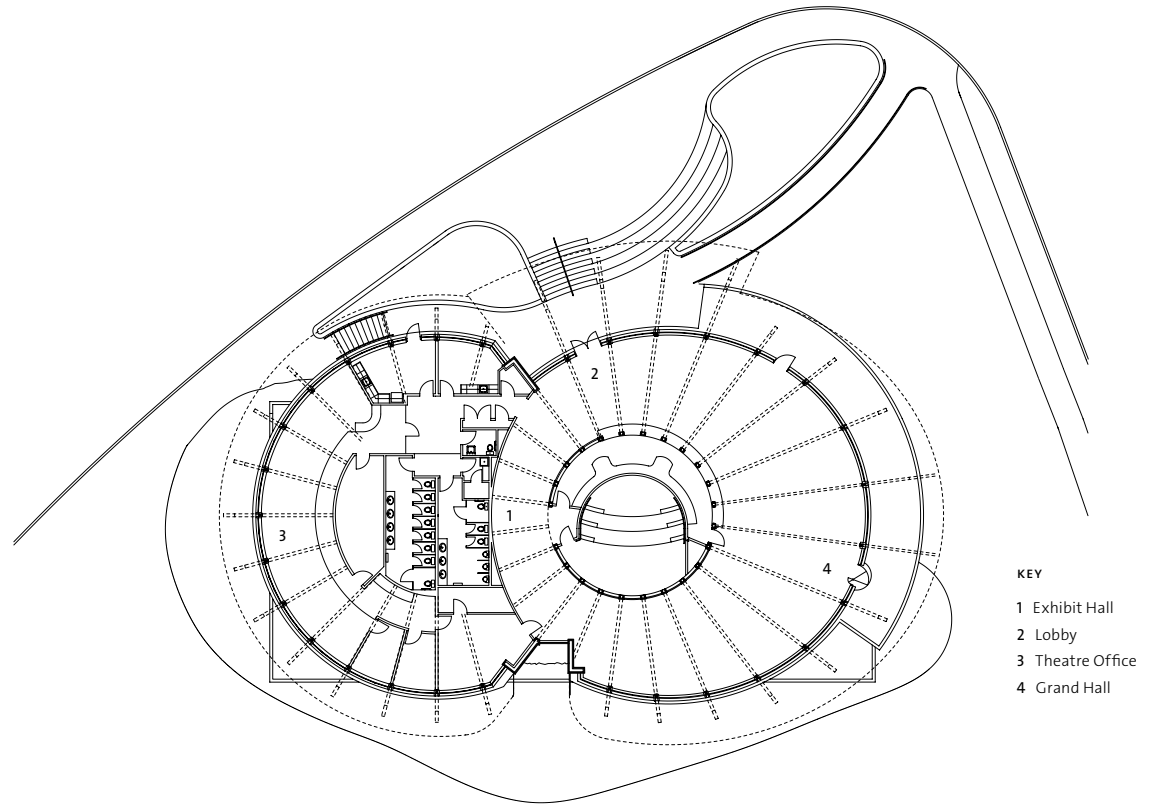


# SQUAMISH ADVENTURE CENTRE





Squamish Adventure Centre



## ARCHITECTURE

**THE SQUAMISH ADVENTURE CENTRE** is a combined visitor centre, outdoor sports museum and economic development office. On the outskirts of Squamish, British Columbia, the *Outdoor Recreation Capital of Canada*, the Centre beckons the 2 million visitors who travel the highway each year between Vancouver and Whistler, which were the joint sites for the 2010 Olympic and Paralympic Winter Games.

Elliptical in plan, with wing-like roofs that hover above transparent walls, the building was created to inspire visitors with the spirit of the coastal mountains. The project was commissioned by the District of Squamish to catalyze its transformation from lumber town to cultural centre.

The client group wanted a striking building, in local materials, that would set a benchmark of quality for the upcoming redevelopment of the town's waterfront on Howe Sound.

*"This project is an example of a new typology of the tourism visitor centre, operating as a combined cultural and historical venue. At its most ambitious—using organic forms and materials indigenous to the area—the design seeks to evoke an immediate awareness of landscape."*

RICHARD IREDALE, PARTNER – IREDALE ARCHITECTURE

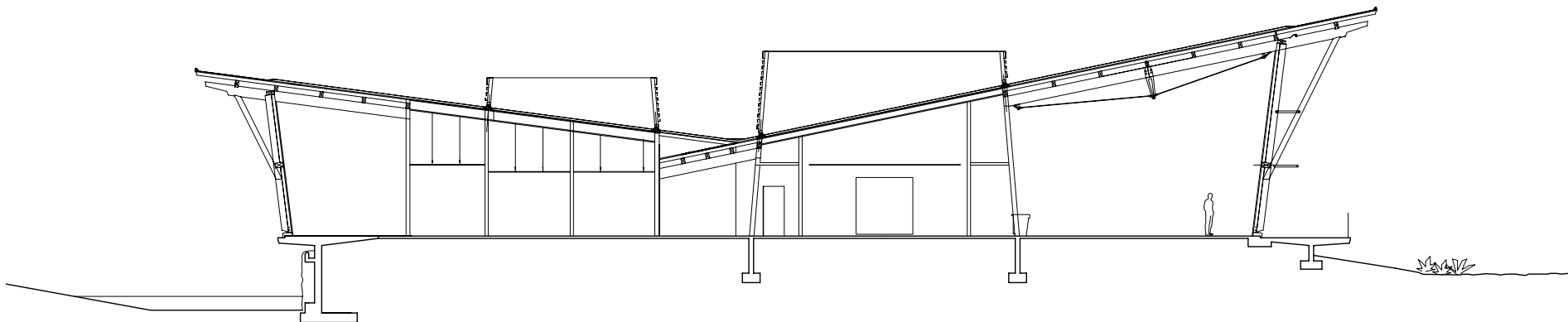
Organic lines and glass curtain walls, of course, are not out of the ordinary in contemporary buildings. What makes the Centre remarkable is that its primary structure is made of Douglas-fir. The heavy timber frame building form, with few, if any, right angles, was made possible through the application of locally based, leading-edge design expertise and manufacturing technology.



## WOOD AND SUSTAINABILITY

**THE ELLIPTICAL GEOMETRY** of the Squamish Adventure Centre contains over 1,000 uniquely shaped heavy-timber members, all made from locally grown Douglas-fir harvested from a sustainably managed forest operated by the Squamish First Nation.

Solid sawn timber has the lowest embodied energy of any major building material, and local harvesting, milling and fabrication minimize transportation energy while providing economic and social benefits to the region.



#### FACTS

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- The Squamish Adventure Centre is a striking example of advanced wood technology and the capabilities of British Columbia's timber frame industry. It shows how modern designs with complex geometries can be quickly and economically built
  - The Centre is built from 60,000 bd ft (142 m<sup>3</sup>) of No. 1 structural and better Douglas-fir timber from the west coast of British Columbia
  - The structure comprises more than 1,000 uniquely crafted elements that required detailing and precision milling in the finest tradition of Canadian timber frame building
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#### FACTS

- The 5,800-ftC (522-mC) building is enclosed by 350 linear ft (107 m) of glazing that reaches a height of 26 ft (8 m) at the north and south ends of the structure
  - The wood structure was designed, detailed, fabricated and erected in just three months to meet a tight timeline of eight months for the entire project
  - The choice of wood in this commercial application highlights the natural beauty and versatility of the Douglas-fir structural timber products for which British Columbia is world renowned
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## STRUCTURE

### **THE ADVENTURE CENTRE'S CURVED BUTTERFLY ROOFS**

—which perch lightly on a supporting structure of exposed timber columns, brackets and beams—are made from 35 different composite steel and timber roof trusses that each have a unique geometry. Combine this with the architects' desire to maximize the transparency of the building envelope by rebating the glazing frames into the vertical wood members, and one can begin to appreciate the complexity of the joinery required.

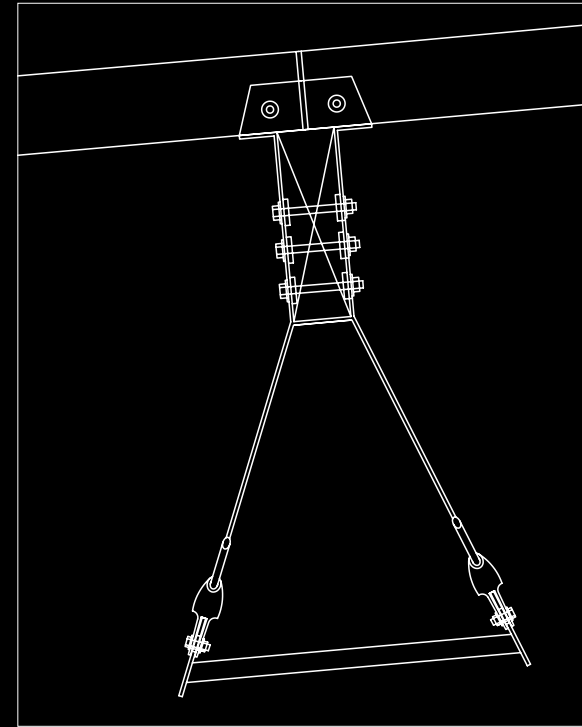
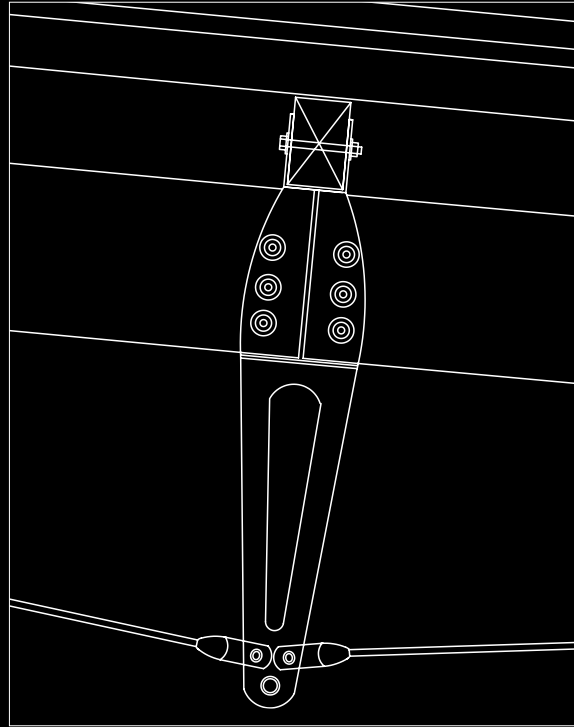
To realize such a complex structure within a strictly limited time frame, each component was computer modelled in three dimensions. Digital production files were then used to instruct computer numerically controlled (cnc) milling machines operated by Fraserwood Industries.

As a result of this pre-planning and precision manufacturing, on-site assembly required only two cranes and a crew of four. Erection of the structure proceeded quickly, with all the pieces of the puzzle fitting together perfectly.

*“Before the advent of sophisticated 3D modelling software, cnc timber notching machines and high-speed internet services, a project as complex as the Squamish Adventure Centre would have taken at least a year, and perhaps longer, to complete.*

*Instead, through a tightly coordinated team effort, Fraserwood Industries, Iredale Architecture and Timberhaven Developments were able to model, engineer, manufacture and erect the timber frame in under six months.”*

PETER DICKSON, PRESIDENT – FRASERWOOD INDUSTRIES



## GEOMETRIC COMPLEXITY MADE SIMPLE

The elliptical geometry of the roof structure posed challenges to the architects, engineers and detailers, both in terms of calculating member dimensions and in designing connections to join framing members set at complex, compound intersecting angles.

In addition, in order to achieve the design's simple architectural elegance, the exterior glass window wall had to fit perfectly into rebeted edges cut into the beams and columns of the timber frame without the help of cover plates or intermediate mullions.

Finally, everything—including the steel connection castings, the fabricated steel kerf plates and the primary and secondary timber framing members—had to be precision fabricated off-site so that field erection could proceed quickly and economically.

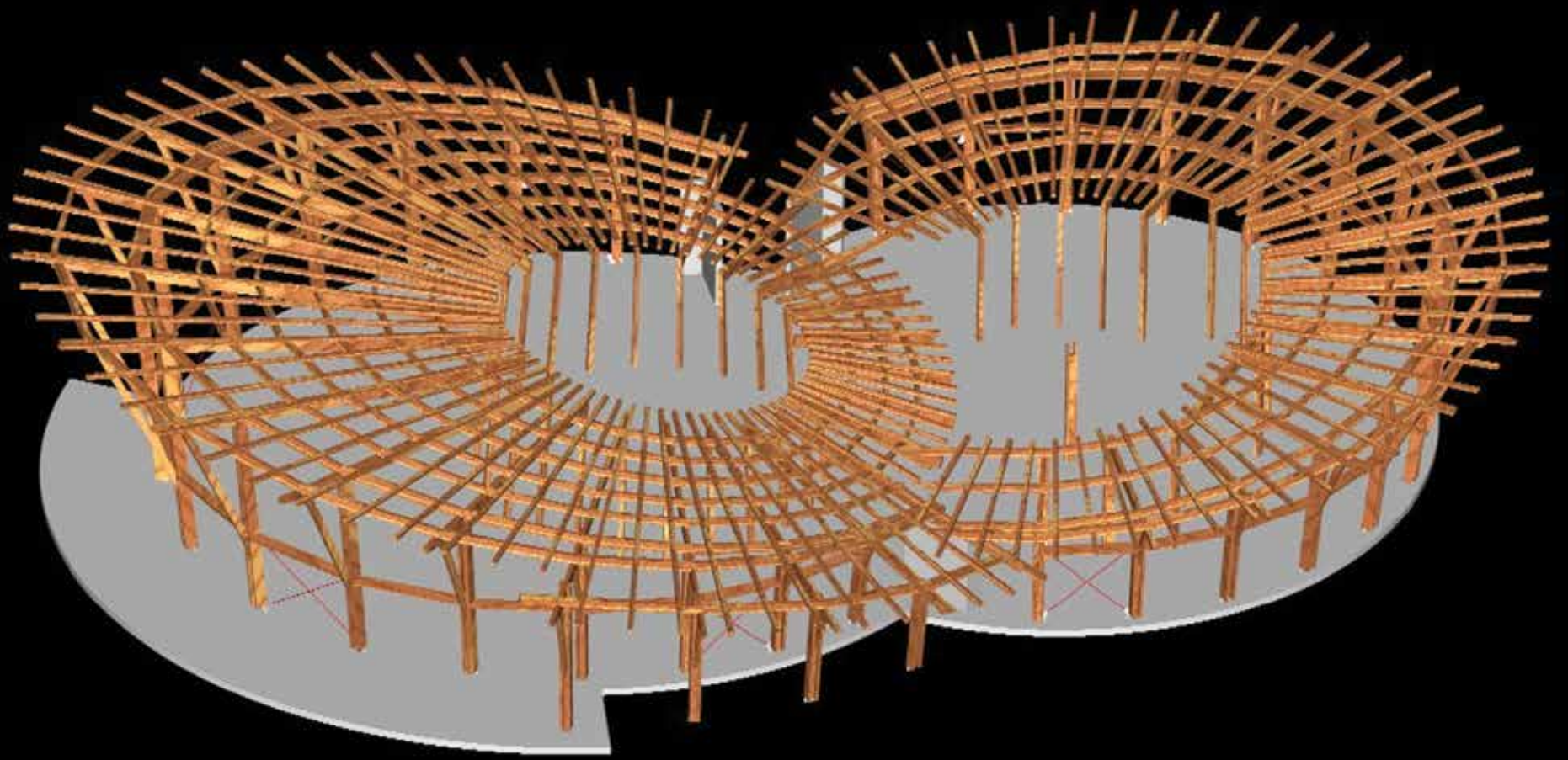
To simplify the timber-to-steel connections in the main roof trusses, the structural engineers developed a pair of universal swivelling connector brackets that join the tension rods to the kingposts and timber top chords.

This meant that the same connection detail could be applied to all 35 trusses, greatly speeding up the erection process, and enabling the structure to be manufactured and erected in less than three months.

Nevertheless, a problem remained: the need to cut adjoining timber members at complex, compound angles (complete with pre-drilled bolt holes and pre-cut kerf grooves), such that timbers would fit together perfectly throughout the structure's elliptical topology. This precise work included the laborious crosscutting of rebeted and mitred edges along the length of each beam and column to receive the exterior glass curtain wall.

To create this level of precision, sophisticated CAD detailing software was employed to generate perfect three-dimensional models of each unique timber connection and timber member. Once developed, these CAD files were entered into the control language of the precision milling robots that final-cut each piece. The process took time, but in the end each timber member fit perfectly and field erection proceeded smoothly.





*“Visitors are completely taken with the building . . . the dramatic design perfectly fits with our objective as a regional portal for business and tourism.”*

BRENT LEIGH, FORMER DEPUTY ADMINISTRATOR – DISTRICT OF SQUAMISH





# SQUAMISH ADV

## PROJECT CREDITS

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### CLIENT

District of Squamish

### ARCHITECT AND STRUCTURAL ENGINEER

Iredale Architecture

### MECHANICAL ENGINEER

MCW Consultants Ltd.

### CIVIL ENGINEER

CJ Anderson Civil Engineering Inc.

### ELECTRICAL ENGINEER

MCW Consultants Ltd.

### LANDSCAPE ARCHITECT

Senga Landscape Architecture Inc.

### CONSTRUCTION MANAGER

Compass Management

### GEOTECHNICAL CONSULTANT

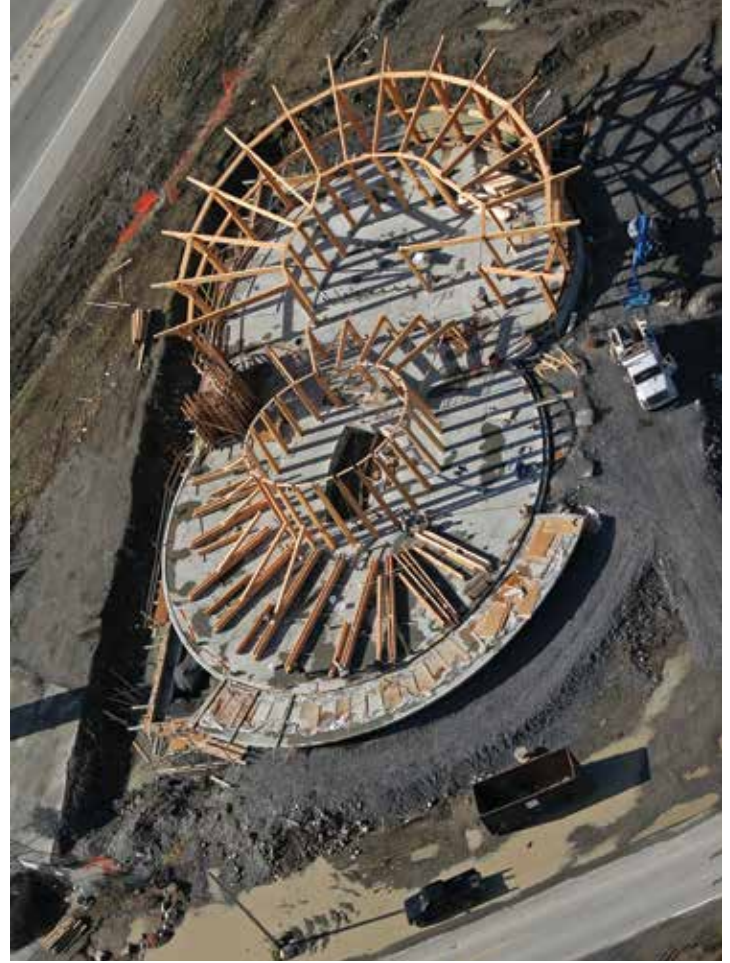
Thurber Engineering Ltd.

### EXHIBITS CONSULTANT

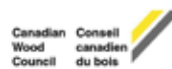
AldrichPears Associates Ltd.

### PHOTOGRAPHERS

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# ENTURE CENTRE