rjc Engineers

Rocky Ridge Recreation Facility

2018 Canadian Consulting Engineering Awards

What's Inside

Project Team Acknowledgments:

gec architecture
Design Architect &
Architect of Record

ARUP
Resource Structural Engineer

STRUCTURLAM
Intelligence In Wood
Glulam Manufactring & Supply

Welcoming the World's Largest YMCA

The City of Calgary is providing comprehensive recreational programming throughout its communities, especially those which are growing rapidly, yet until now, remain underserved. Nestled within the foothills of northwest Calgary, Rocky Ridge Recreation Facility sits gracefully within the surrounding reconstructed wetlands.

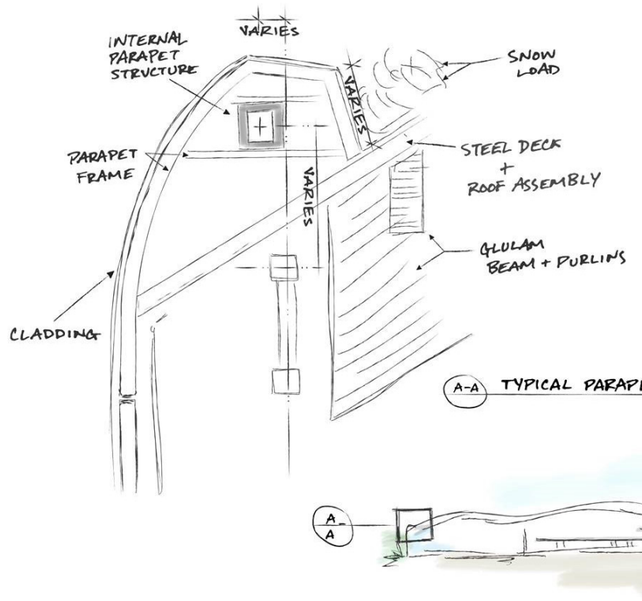
RJC Engineers were Structural Engineers for what is being named the world's largest YMCA, underneath North America's largest single wood roof; bringing together a growing community of 58,000 people, within an impressive much-needed gathering space.

Innovative Design

Rocky Ridge is a true testament to structural engineering excellence. With its rare shape and undulating lines, the structure showcases a high degree of creativity and innovation. RJC worked in close collaboration with the architect and contractor to develop the best design options to achieve the City's goals to create a community space that was practical, cost-effective and aesthetically striking.

Currently recognized as the world's largest YMCA, Rocky Ridge provides collaborative spaces to meet the community's needs. With amenities that include leisure and hockey ice surfaces, competition pool, a wave pool, three gymnasiums, a fitness centre, an elevated running track, an open-concept self-service library, a 250 seat theatre and art studio with exhibition space, the facility introduces a wealth of opportunities, under one roof.

North America's Largest Single Wood Roof Structure



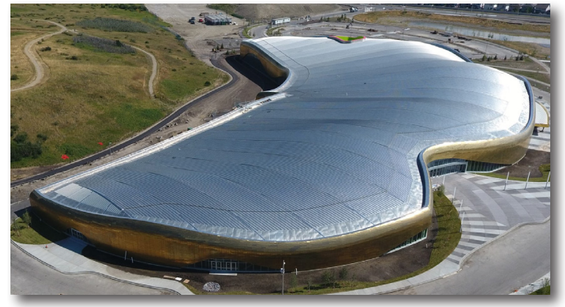


Image courtesy of PCL Construction

The unique architectural design was inspired by the surrounding rolling foothills. The roof, with its low and horizontal form, seamlessly integrates the large facility into the natural contours of the site. Aiming to meet LEED Gold standards, Rocky Ridge features the largest single wood roof in North America, at 186,000 sq. ft. This key structural feature was an innovative design solution developed by RJC and GEC Architecture to achieve the architectural demands of the building's irregular, contouring shape. The use of one common beam shape came to define every main roof beam; this repetition became the solution in reducing costs and improving efficiency, while maintaining the allure of the building's interior focal point. Finalizing the shape and form of the roof involved intimate project team collaboration. RJC, GEC Architecture, roof assembly suppliers and Structurlam formed a passionate and dedicated team who worked tirelessly together to create this unique shape in a cost-effective manner.

With such a complex, continuously curved roof structure, and large overall building footprint, the effects of snow accumulation on the facility also had to be considered. A snow study was conducted early in design, determining a continuous parapet would be required around the perimeter of the building to prevent falling ice and snow. With a varying parapet elevation along the building's 640+m perimeter, the geometry and layout would be different at every location. To address this issue from an economical and schedule standpoint, RJC conducted an extensive design exercise to develop an innovative structural detail for continuously varying locations, allowing for consistency throughout the building and improved constructability. A conceptual sketch of this novel approach is shown above.

With a footprint of 284,000 sq. ft., Rocky Ridge will allow people to find a space to come together and enjoy a highly unique recreational experience – one that does not simply provide an indoor sports and leisure centre, but a beautiful structure that elegantly brings the natural outdoors, in.

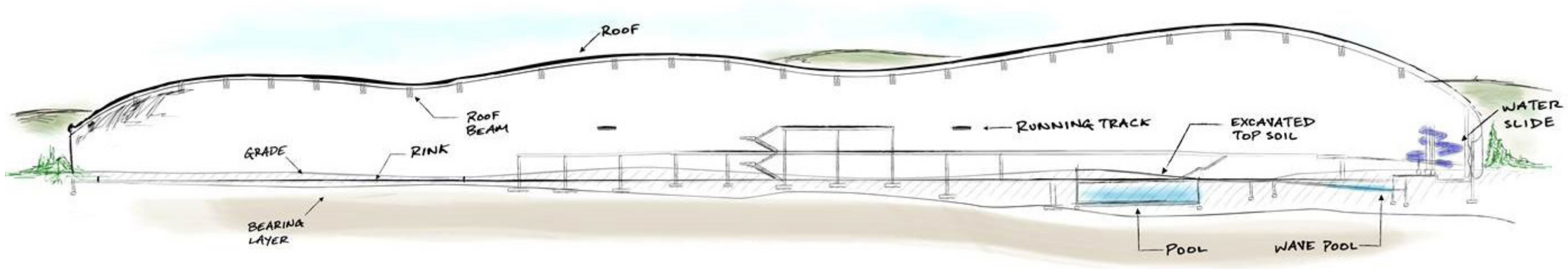
Complexity

Rocky Ridge presented various structural challenges where the project team carefully revised the overall approach to meet design demands. The accommodation of a range of large programming spaces under a single roof created long, open spans throughout the building, with column spacing often in excess of 35m. To maximize functional space within the building, and provide open spaces free from structural obstructions, the structural design utilized a perimeter bracing column system. With a continuous diagonal perimeter steel column configuration providing support for long-span glulam beams that connected at different angles and elevations, this highly complex connection condition posed design challenges to address lateral, axial, gravity and impact loads with conditions of varying geometry, and the interface of multiple different materials. RJC conducted extensive design optimisation of this critical complex connection, to not only address the design concerns noted above, but also provide a singular bearing detail that could be applied at locations of varying geometry to improve constructability and increase efficiency.

In order to minimize potential conflicts, errors and site changes throughout the construction, the project team took on an approach called clash detection, allowing for improved efficiency and better overall team coordination. A fully synchronized three-dimensional building information model (BIM) was produced, allowing every sub-trade to embrace the use of a global working model; utilizing it for various representations, in-depth assessment and reviews to improve project coordination and efficiency throughout.

Challenging Soil Strata

The different soil layers on site also posed a unique challenge; unlike most recreation facilities, Rocky Ridge's interior layout was designed to accommodate the soil's challenging strata, rather than attempt to change it. The team worked collectively to strategically position event spaces, whilst taking into consideration the depth for excavations based on these soil layers; for example, the pools are situated where the bearing layer was the deepest, following the natural slope and native bearing of the soil. Through this approach, and the reduced need for engineered fill, the team was able to save on construction costs and improve schedule. Refer to conceptual sketch below detailing the differences in bearing layer and grade.



Social & Economic Benefits

With a population of nearly 58,000 Calgarians within the northwest region of the City, Rocky Ridge brings significant benefits with the function of serving the adjoining communities with new and exciting recreational and leisure opportunities. With views of the City and the mountains, Rocky Ridge features not only extensive programs within the facility, but also over four kilometers of public walking trails in the nearby areas.

Recognizing the need to promote active and creative living, the amenities include multi-purpose rooms, a physiotherapy and medical clinic, art studios, a theatre and a unique, self-serve City of Calgary library. In line with the City's vision for more comprehensive programming in all communities, and designed with input from local community associations and residents, Rocky Ridge is an iconic, multi-purpose facility attracting people to come play, learn, exercise, relax and have fun. Admired as a "building within a park", the elegant structure encompasses everything from indoor to outdoor spaces, enriching families and strengthening relationships through a list of diverse possibilities.

Sustainability

Designed in accordance with Calgary's sustainability design guidelines, and with as limited an impact on the surrounding environment as possible, the project is aiming to achieve LEED Gold designation, while ensuring the natural habitat and surrounding wetlands continue to thrive. The team worked collaboratively to minimize energy consumption and environmental impact during the initial stages of the project, defining strategies to achieve LEED.

RJC favored wood as the fundamental element of the roof, not only for its aesthetic feature, but also as a material that is easily accessible, renewable and reusable, making it the most sustainable structural design solution. The use of 2,750 m^3 of glulam within the facility offers tremendous sustainability benefits through carbon impact. According to the Canadian Wood Council's carbon calculator, 2,473 metric tons of CO_2 are stored in the glulam, while 957 metric tons of CO_2 were avoided by using wood products, compared to non-wood products. The carbon benefits from using glulam within Rocky Ridge equals taking 725 cars off the road for one year, or removing the CO_2 emissions from operating 362 homes for one year.

The team also carefully evaluated the cost savings potential of logistical material transport from BC, reducing the beam lengths to a maximum of 25m and erecting and splicing the beams on site, decreasing shipping costs. In addition to the improvement in manufacturing and supply schedule, as well as environmental benefits, this efficiency in transport allowed the team to provide a project cost savings of over $3 million.

Achieving the Client's Vision

The multifaceted structure demanded creativity and innovation with the design. We approached the project through the eyes of unconventional construction and the project team was able to develop a structure to maximise the project's value to the community. Flawlessly blending unconventional design approaches with the natural grandeur of Alberta's rolling foothills created a showcase of ingenuity and innovation.

With obvious exterior brilliance of the structure aside, the real community impact will be recognized by what's inside the facility. The much needed amenities will be a great contribution to promoting community, health and wellness and further recreational opportunities for more Calgarians.

One of four new facilities meeting the needs of The City of Calgary's ambitious community development and recreation plans, Rocky Ridge will serve the northwest communities as they continue to develop. The project was highly anticipated to promote an active, integrated and creative lifestyle. With its abundant list of activities available outdoor and indoor, Rocky Ridge truly meets these demands, while remaining practical as a project, with respect to cost and construction.

The collaborative team's unconventional approach not only maximized the project's value to the community but also delivered the client's vision of constructing an elegant, purposeful structure that emulated the natural landscape, bringing the natural outdoors into the exceptional interior space. The result is a brilliant structure for the community, with a sophisticated and striking exterior and an exceptional interior layout.