

CALGARY'S NEW CENTRAL LIBRARY



Named one of Architectural Digest's Libraries of the Future, and one of the World's 12 Most Anticipated Buildings of 2018, the New Central Library is one of Alberta's most important and distinctive cultural institutions, with signature design by Snøhetta and Architect of Record, Dialog. Since opening, the library has been celebrated for incorporating design-forward features, including an interlocking hexagonal façade and a western cedar clad grand entryway portal inspired by Alberta's Chinook Arches.

Entuitive's role: Structural Engineering Consultant

INNOVATION

With striking architectural design, the New Central Library, located in the vibrant East Village, is one of the most significant and distinctive cultural institutions in Alberta. The structure was built over Calgary's busiest LRT line and occupies four storeys, comprising 278,000 sq. ft. (with approximately 240,000 sq. ft. of usable library space). This was the first project of its kind in Calgary where a building was constructed over an active passenger train line.

The library's design places a strong emphasis on public accessibility and community-oriented spaces with 80% of the building allocated to public space. As a library, the load of the books, along with over 12-metre spans, means the columns supporting the steel trusses of this four-storey building carry the equivalent weight of a 30-storey commercial building. Viewed from outside, the library's curving façade is inspired by snowdrifts and utilizes clear and fritted glass openings that will serve to control desired daylight levels inside.

The library's entryway is designed to resemble a Chinook Arch cloud formation. The three-storey (15-metre) tall trusses have architecturally exposed web members with the largest members composed of built-up four plies of 100 mm (4") thick plate. The largest truss spans 55 metres, is curved, and supports another 30-metre spanning truss.

The main purpose of these steel trusses is to allow for the architect's column-free vision in the main entrance and to enable the building to take its distinctive shape and span over the LRT encapsulation to create an open and inviting public entrance. Within the heart of the building, an oculus with a steel framed skylight allows natural light to permeate through the soaring four-storey atrium, which includes three massive steel-framed cantilevered staircases and assists library users with wayfinding. A truss on the north end of the building cantilevers out over the LRT tracks and features a café that provides a unique view of the trains exiting from the tunnel underneath.



COMPLEXITY

The library sits over Calgary's busiest light rail transit (LRT) line. It presented many unique structural challenges. The curved shape of the LRT line helped achieve the library's distinctive shape by mirroring the curve along its longitudinal axis. Cost-effective structural solutions involving long span conventionally reinforced concrete floor framing and long span mega trusses provided large column-free spaces at the main entrance. The north tip of the building cantilevers 10 meters atop the LRT train tracks below. The design and construction of the library resulted in innovative approaches of construction, especially with the encapsulation (tunnel extension). Scheduled shut downs of the LRT line are quite expensive and so the goal was to minimize these. The encapsulation design utilized permanent precast wall panels to act as a safety barrier between the construction workers and the trains and vice-versa. Pretensioned double and single tee heavy duty precast panels were utilized for the curved in plan roof framing. Fifty-seven different types were used and only one or two were repeated.

For the building, a truly hybrid concrete and structural steel building was chosen as the optimal materiality of the building. Cost, constructability, and aesthetics drove the building framing. The challenge of creating an inviting grand entrance to the library atop the LRT train line required large column-free spans which was achieved by several large trusses. The largest curved in plan and sloped in elevation mega truss was utilized atop the entrance, spanning over the encapsulation to create an inviting and grand front entrance.





SOCIAL AND/OR ECONOMIC BENEFITS

The New Central Library is a landmark building and architectural icon within Calgary's East Village community, serving as a cultural and physical connector that links the thriving East Village with Calgary's downtown core. The library serves as a true gathering place for Calgarians, with a variety of programs, events, and activities that will both encourage interaction and stimulate learning and engagement.

The building design places a strong emphasis on public accessibility and community-oriented spaces that inspire thought, collaboration, and conversation. With 80% of the four-storey 278,000 sq. ft. building (which encompasses approximately 240,000 sq. ft. of usable library space) allocated to public space, New Central Library serves as a multi-faceted gathering place accommodating the ever-evolving needs of Calgarians. Features of this innovative building include special programs and spaces for children and teens, meeting spaces, quiet spaces, and a technology commons and laboratory for innovation.

With over 30 free bookable spaces for the public to enjoy, most of which are equipped with the latest audio/visual technologies, the library is truly a community hub for the East Village and all of Calgary. More patrons visit Calgary's libraries a year than all sports and entertainment venues combined (including the Stampede, Calgary Flames, and Stampeder games). The new library design is more than just a library, it is a community hub.



ENVIRONMENTAL BENEFITS

We used a very high-level of slag in the concrete (50-70% typical: very innovative at the time). This meant we had a high percentage of recycled content in the mix, greatly reducing embodied carbon emissions for cement manufacturing. We used extremely local aggregates from nearby Exshaw, reducing the carbon associated with shipping this material. Using architecturally exposed concrete reduced the overall amount of finishes required: less wall and ceiling finishes, less framing, than would otherwise be required for a building of this scale.

The project is pursuing LEED-NC) 2009 Gold Rating through the Canadian Green Building Council (CaGBC). The project has been formally registered as project number 17076 with the CaGBC.

The project optimizes human comfort with radiant heating and cooling (with hot water coming from the District Energy building two blocks away) while minimizing the need to condition outdoor air by having a dedicated outdoor air system (DOAS). It supplies outdoor air to the space at a low level and low velocity, known as displacement ventilation which efficiently removes unwanted heat and contaminants as the supplied air rises through the space. Energy Recovery Wheels then use the exhaust air stream to temper the fresh air intake. The project ties into an existing District Energy plant for heating needs. Lighting use is controlled by both occupancy and daylighting sensors, and features a targeted lighting power density 25% better than ASHRAE 90.1-2007. The envelope is composed of less than 40% window area relative to solid wall.

MEETING CLIENT'S NEEDS

We believe the building exceeded the client's project goals and the consulting, contracting, project management teams are all very pleased that it was delivered \$10 million under budget and one month ahead of schedule.

As envisioned, the New Central Library is now a space "To Inspire All". The location of the New Central Library is adjacent to Calgary City Hall and strengthens the fabric of community life by weaving East Village, the original heart of Calgary, back into the story of Centre City. The new library is effectively a bridge between East Village and the City Core, creating a new meeting place for Calgarians.

The new building is an opportunity for the library to redefine its public identity to reflect their values around modernization, community well-being and public interaction. The library is a platform for new and innovative programs designed specifically to serve Calgary's growing population. This population includes over 120,000 workers who travel downtown every day and over 45,000 students attending educational institutions in Calgary.