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RIDDELL LIBRARY AND LEARNING CENTRE MOUNT ROYAL UNIVERSITY 2018 CANADIAN CONSULTING ENGINEERING AWARDS



SUMMARY

Mount Royal University imagined the Riddell Library and Learning Centre to be the academic heart of the campus – a highly flexible, LEED Gold creative space that will adapt to the technology of tomorrow. As the mechanical engineers on the project, Smith + Andersen designed an ultra-low energy mechanical system that adapts to the building demands and reduces overall energy consumption by 54.9%, as compared to an ASHRAE 90.1-2007 standard building.



INNOVATION

The Riddell Library and Learning Centre at Mount Royal University is a four-storey, 1,600 square metre (17,220 square foot) facility strategically developed to meet the evolving needs of 21st century students. A conventional library with a modern twist, the majority of the RLLC's collection is made of eBooks and eJournals, adapting to technology that continues to change the ways that students access information. University stakeholders and faculty challenged the design team to define the parameters of a relevant library in 2018. The resultant design facilitates the evolution of learning through adaptable spaces that complement the library tradition, while remaining environmentally responsible and relevant in the modern connected era.

While the RLLC includes approximately 535,000 monographs and 81,000 journals, it also promotes a hands-on approach to learning with technology-driven suites. A maker studio, equipped with 3-D printers, scanners, industrial sewing machines, and laser cutters, allows students to create rapid prototypes of creative solutions. Audio production rooms and media editing suites are used to create music and podcasts, while visualization rooms include wall-sized interactive touch screens. An immersion studio features 360° projections, allowing students to explore through virtual reality. Incubator spaces throughout the facility allow groups to collaborate without disturbing students in the reading room and study areas.

Much like the design of the RLLC itself, the mechanical design team took a conventional design approach with a modern twist. The exposed ceilings and library collections are carefully considered in the mechanical design of the space. Hydronic systems are located away from document stacks to mitigate the risk of damage from leaks. A central building heat recovery unit removes heat from the building exhaust and pre-treats incoming ventilation air. Air side economizers on the three main air handling units utilize Calgary's moderate climate to minimize the mechanical cooling system run time during shoulder seasons and summer months. A high-efficiency condensing boiler system delivers variable temperature heating water from the central mechanical penthouse to a cascaded hydronic hot water system.

The controls systems are consistent with existing systems throughout campus to provide continuity for operations staff, but enhanced control strategies are also included in order to reduce energy consumption. Space feedback systems, such as occupancy, daylight, and demand-controlled sensors, are included throughout the facility to automatically respond to system requirements. The library is also equipped with a stand-alone back-up generator to ensure critical system operation in the event of a power outage.



Boilers



Air Cooled Chiller



Air Cooled Chiller

COMPLEXITY

From the beginning, this modern post-secondary library required highly flexible and adaptive spaces for students to research, collaborate, and innovate. In this digital age, demands are driven by advances in audio visual and information technology systems, many of which were not commercially available when the building design started. "Future-proofing" and flexible integration of these systems became one of the more complex elements for the project team. Special care was taken to ensure that the building infrastructure was designed with the ability to adapt to future trends and demands. This was done in a manner that did not compromise the overall occupant experience, and was carefully designed into behind-the-scenes building systems. Integrating these systems increased the complexity of the building design and construction, and required additional coordination with specialty IT/AV consultants throughout the process.

Complex buildings require complex building controls. A modern building automation system was installed to allow for automated control of the building's mechanical and electrical system. Utility metering provides continuous feedback on energy and utility consumption, which allows the controls to automatically adjust and respond. Installation and commissioning of these systems created a unique challenge, as they required an iterative approach during the initial setup. The team worked together to identify the sequence of events for installation and setup, leading to successful commissioning. Optimizing the building energy performance required complex programming to provide ideal results.



Fan Array in Air Handling Unit



Mechanical System Circulation Pumps

SOCIAL AND ECONOMIC BENEFITS

The Riddell Library and Learning Centre is an innovative facility that builds on the strengths of the traditional library, while also developing new strategies for advancing learning, teaching, and research. The library promotes an integrated approach to education by creating a hub where students, faculty, researchers, and members of the community join together to share ideas and histories. As the “academic heart” of the Mount Royal campus, the library embraces the community and invites them to engage and build a bright future together.

Mount Royal University is dedicated to the preservation and promotion of the Indigenous heritage of the community. The library is the first building on campus to include signage in Blackfoot, and is also home to a dedicated Elders Circle program where Indigenous knowledge keepers share their teachings with the community. A digitization and specialized collection project continues to build an important Indigenous archive around languages, oral histories, the Truth and Reconciliation Commission initiatives, and the stories of missing and murdered Indigenous women.

The RLLC includes a secure and environmentally-controlled archival space for important publications and special collections. The archive space temperature and humidity is monitored and controlled by the building automation system. If space conditions deviate from the established set point, University building operation staff are immediately notified. The area includes a public reading room for individuals working with collection materials, a compact document storage area, and an art and artifact storage area. Office and lab space include equipment dedicated to the preservation of the historic holdings.





ENVIRONMENTAL BENEFITS

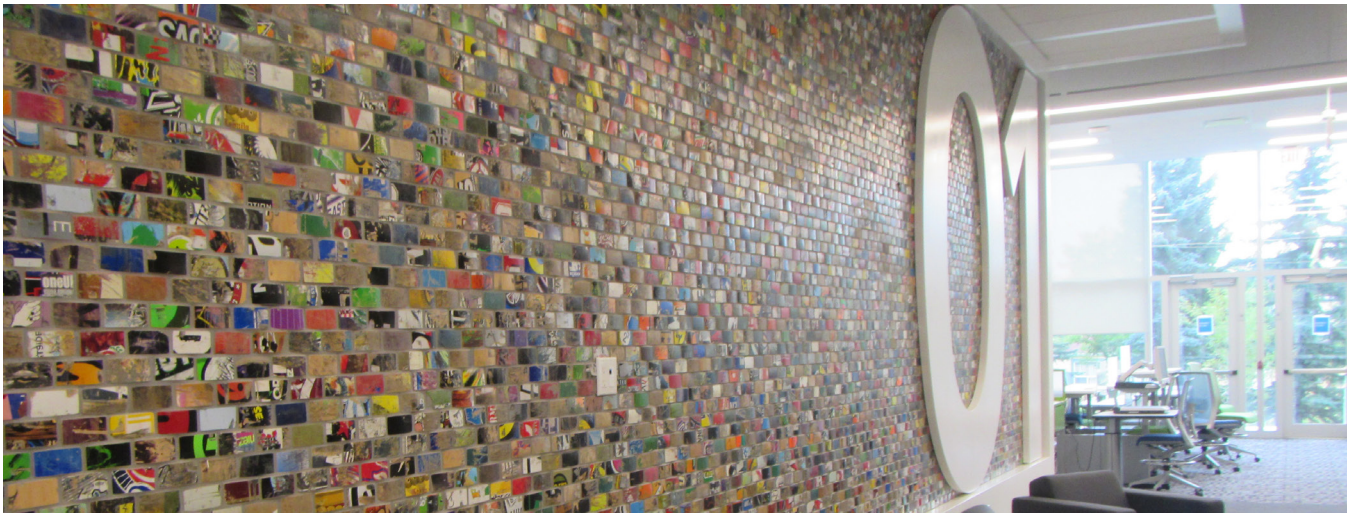
The RLLC is targeting LEED Gold certification with 16 of a possible 19 energy and atmosphere (EAc1) points, resulting in an annual energy reduction of 5,788,561 kWh per year (54.9%) compared to the ASHRAE 90.1, 2007 baseline model. Additional environmental benefits include an annual reduction in potable water consumption of 890,000 litres per year or 36.8% less than an institutional building of similar occupancy.

All mechanical and electrical systems are integrated into a central campus automation grid where systems are continually monitored and adjusted to meet occupancy demand. A series of “smart” building meters installed throughout the facility provide building operators with continuous feedback on energy consumptions and allow for further system optimization.

Other energy efficient building features that were implemented into the Riddell Library and Learning Centre include:

- Heat recovery
- Demand controlled ventilation with CO₂ monitoring
- Ultra-high efficiency cascading heating system with condensing boilers
- Modular air handling units capable of free cooling
- Magnetic bearing air cooled chiller
- Variable speed pumping and fans
- Occupancy sensor lighting and HVAC controls
- LED lighting/daylight sensors with central lighting controls
- Integrated solar shading control
- Advanced building control system
- Ultra-Low Flow Water Fixtures

End-of-destination bike lockers and showers are available for library staff who choose to cycle to work, while treadmill design allow students to walk while they study. A campus-wide waste diversion program separates organic waste and recycling. Specialized recycling collection stations are also available for students and faculty to recycle batteries, cell phones, pens, printer cartridges and toner, electronics, and even furniture.



MEETING CLIENT'S NEEDS

Mount Royal University is committed to the development of a sustainable campus through the creation of spaces that are ecologically sound, socially just, and environmentally viable. The campus master plan also requires that all new buildings are designed to LEED certification standards, and divert 70% of paper, organics, and recyclables from landfills. These concepts were recurring themes and a driving force behind the design of the Riddell Library and Learning Centre.

With these goals in mind, the Mount Royal University stakeholders and faculty presented the design team with a challenge: How can we develop a library that will inspire the students of today and tomorrow within the campus' sustainable parameters? A strategic plan was developed for the library with a goal to become a catalyst for knowledge, a home for the generation of ideas, and a space that fosters connections and community.

The design team used an integrated approach, collaborating closely with the university and across divisions to build an inspiring, adaptable, and technology-driven space. The mechanical system provides high-quality support of each space, discretely designed to suit the airy and open structure, all while remaining efficient and sustainable. The facility design encompasses the library's vision to "ignite exploration, learning, creation, and sharing" through each carefully tailored space.

