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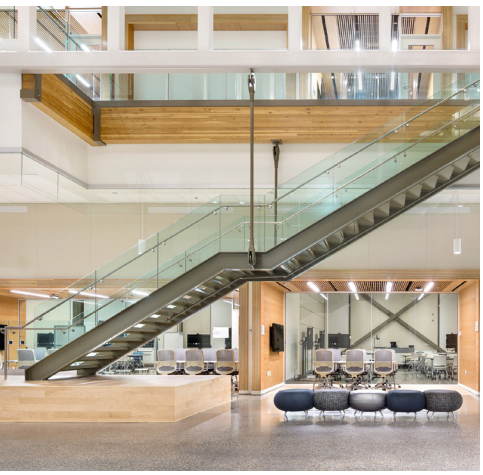
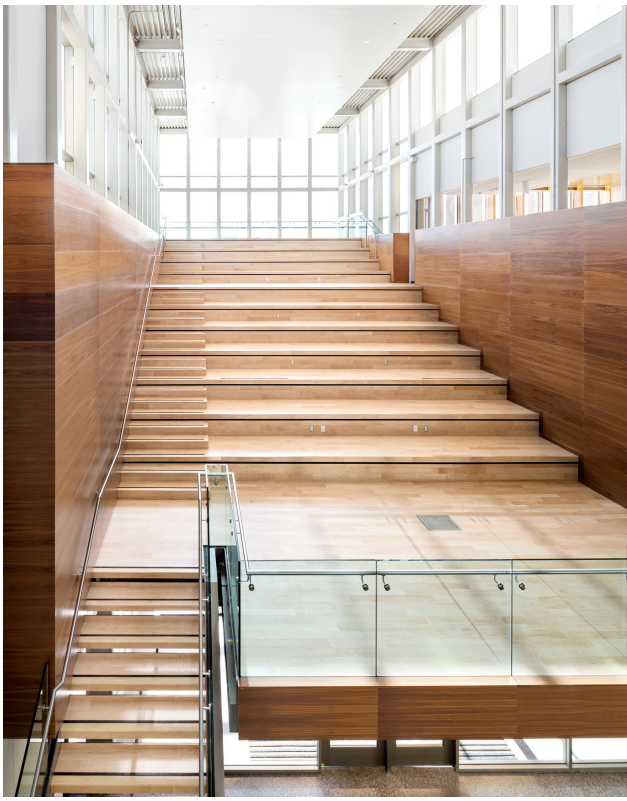
TAYLOR INSTITUTE FOR TEACHING & LEARNING

UNIVERSITY OF CALGARY

CANADIAN CONSULTING ENGINEERING AWARDS 2017 SUBMISSION





Project Summary

The University of Calgary's Taylor Institute for Teaching and Learning was created to develop new techniques in education. The mechanical design team (Smith + Andersen) was challenged to meet aggressive energy conservation targets and create an innovative system for the unique structure on the foundation of the former Nickle Arts Museum. The design performs at 72.8 % better than MNECB, with 19 LEED® energy and atmosphere points, including an Innovation In Design point for exceptional energy use reduction.

Innovation

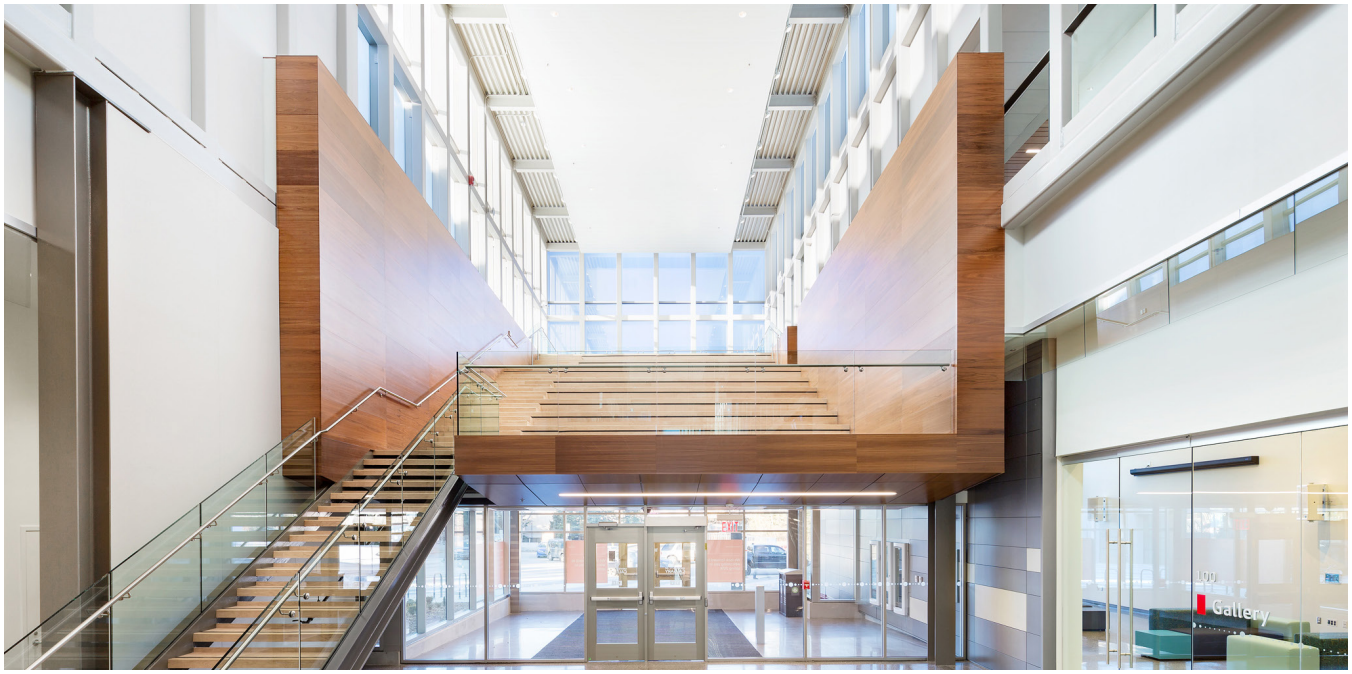
The Taylor Institute for Teaching and Learning (TITL) is a cutting-edge, two storey, 4,000 square meter facility in the physical and social heart of the University of Calgary Main Campus. The facility was built on the site of the original Nickle Arts Museum Building and is intended to represent a transformation in the profession of teaching and learning. The project was fostered by a generous donation from Don and Ruth Taylor to the University to design and construct a unique environment that allows educators to develop innovative new techniques and ideas that allow for the advancement of professional educating. The goal of the project design team was to create an environment that was as innovative as the ideas that would later be developed within it.

Innovative solutions were utilized from the project's conception to ensure that the ambitious green targets would be achieved. 89% of demolition, construction, and land clearing waste were diverted from landfill, and silt fences, silt socks and tire washes preserved the site's native soils. 99% of the interior wood finishes were sustainably harvested and certified by the Forest Stewardship Council. The landscaped areas incorporate drought-tolerant grasses and native vegetation to reduce irrigation requirements, using 70% less potable water than conventional design. The building features high-performance windows, LED lighting controlled by daylight

Central Atrium

sensors, low-flow hot water fixtures, a high-efficiency water heater, superior roof insulation, radiant heating and cooling, and energy sourced from the campus district energy plant. A light-coloured membrane covers the roof to reduce heat absorption, which reduces building cooling requirements in the summer months.

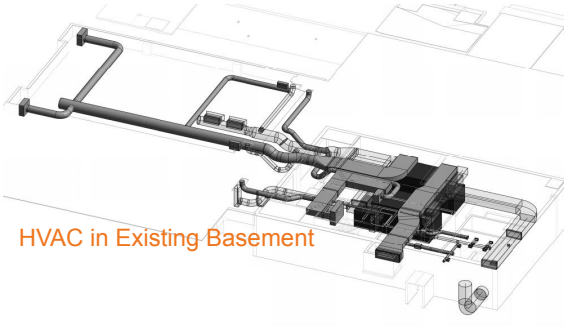
The challenge for the mechanical design team was to develop and design a system that complemented the unique form of the building, while still meeting the aggressive energy conservation targets set as a goal at the beginning of the project. The end result was a design that performed 72.8 % better than Model National Energy Code for Buildings, gaining all 19 LEED® energy and atmosphere (EA Credit 1) points including an additional Innovation In Design point for an exceptional energy use reduction, while still maintaining the architectural form and vision and University's building reuse requirements.



Social Stair Interior

Complexity

Early in the project's development, it was decided that the existing Nickle Arts Museum basement would be reused to house the new TITL mechanical equipment. The mechanical design team used a dedicated outdoor air system (DOAS) in conjunction with radiant heating and cooling systems in an effort to reduce the physical size of the equipment. The team was challenged when it was decided that all of the new mechanical equipment must fit through a 2500x2500mm opening in the existing main floor slab above the basement mechanical room. All major mechanical equipment needed to be designed and delivered to site in modules, dropped into place, and reassembled. The team utilized fan wall modular air handling systems to reduce AHU dimensions and deliver superior acoustic performance, eliminating the need for large silencers in an already constrained mechanical space.



HVAC in Existing Basement

By decoupling the heating and cooling from the ventilation, the mechanical team was able to utilize the University's central plant along with a variety of radiant heating and cooling systems within the occupied spaces, which reduced the requirement for large heating and cooling equipment in the basement mechanical room. The final mechanical design required only a series of small circulation pumps and heat exchangers to be located alongside the DOAS air handling systems, allowing for all major mechanical equipment to fit within the existing basement space.

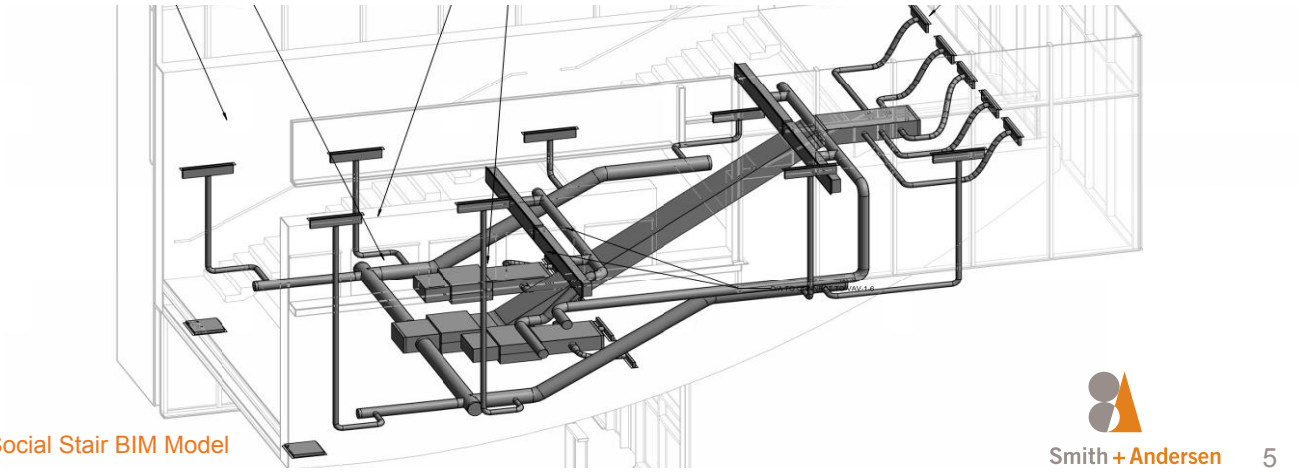
Social and/or Economic Benefits

One of the architectural goals of the project was to create an inviting building form that draws faculty and students into the building by creating large open public spaces in which individuals can gather, meet and engage in casual interaction while not interfering with the day to day function of the programing requirements of the building. The building design was inspired by the principles of flexibility, transparency and collaboration, and contains three fully adaptable learning spaces to fulfill the evolving needs of faculty and students. The building embraces its location at the heart of campus with a translucent glass spine, which welcomes groups and individuals with an openness to both observe and participate in the experimental spaces. This transparency of the structure also acts as a beacon at night, illuminating the area with a warm glow, and inviting the university to engage in the space.

Social Stair Exterior

Social Stair Mechanical Services

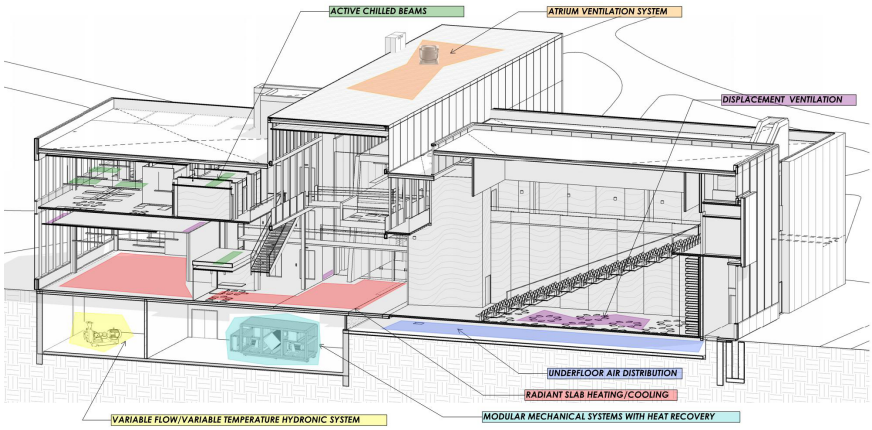
The mechanical systems within these spaces must adapt to fluctuation in activity and demand, as well as space configuration, to provide a comfortable environment for 2 to 200 individuals. The systems also need to be integrated in such a manner as to not compromise the architectural vision. A key design element of the building was a large interconnected atrium space in the centre of the building constructed of a large Vierendeel Truss system. The architectural team challenged the mechanical designers to develop a way to heat and cool the space with very few mechanical services interrupting the occupant's visual experience within the atrium space.



Social Stair BIM Model

Environmental Benefits

The design team was challenged to design and develop a system that would meet the University of Calgary's aggressive energy conservation goals. The University's Institutional Sustainability Plan mandated that the minimum energy use targets for TITL would need to be at minimum 56% better than MNECB. During the early stages of schematic design, the team was tasked with using Living Building Challenge (1) as a goal for the level of sustainable design and energy consumption.



Living Building Challenge has been developed as a rating system that goes far beyond the standard LEED® 2009 rating system requirements, and is intended to be the next level of sustainability to promote Net Zero energy and water usage without the use of fossil fuel consumption. Due to the University's requirement to utilize their central heating and cooling plant, which burns natural gas, the design team could not proceed with the full Living Building Challenge submission, but decided that the system designs would proceed on the premise that a "Net Zero Ready" building would be the goal. Net Zero Ready refers to a building in which the anticipated energy consumption could be offset by the installation of PV cells within the space constraints of the building site.

At 72.8% better than MNECB, TITL has achieved a new level of sustainability on campus that paves the way for future "Net Zero" energy projects in Calgary's northern climate.

Radiant Piping Manifold

Radiant Heating / Cooling Piping

Chilled Beam in Feature Ceiling

Meeting Client's Needs

As demonstrated, the Smith + Andersen mechanical design team was able to balance innovation in energy use with aesthetic appeal and functionality to meet the University of Calgary's project requirements for the Taylor Institute for Teaching and Learning. This was done through an integrated and collaborative design approach involving all members of the project team.

As with any project, budget and schedule were a key factor to the overall project success. The building was delivered to the University of Calgary on budget and six month ahead of schedule. Again, this speaks to the commitment of the entire project team to approach challenges in a collaborative manner to ensure schedule and budget were maintained while still ensuring the project requirements were met.

The Taylor Institute has become a key centerpiece in the heart of the University of Calgary Foothill Campus, and will be a place that fosters and develops new and innovative ideas for generations for future educators that study within it.

Acknowledgments

Smith + Andersen would like to acknowledge all member of the TITL design/ construction team along the University of Calgary and especially Don and Ruth Talyor for their generous denotation which made this innovative project a reality.

Funding Donor: Don & Ruth Taylor
Client: University of Calgary
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Architect: Diamond Schmitt Architects
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