NorQuest College

Singhmar Centre for Learning

CCE AWARDS

"The design of the Singhmar Centre for Learning responds to the uniqueness of NorQuest's openness, transparency, and flexibility."

Charles Lau
PROJECT ARCHITECT

DIALOG®

Project Summary

The new NorQuest College Singhmar Centre for Learning (SCFL) building in Edmonton transforms NorQuest's downtown campus. NorQuest College is one of the most diverse and supportive colleges in Canada, embracing inclusiveness and providing attainable, workplace-ready educations for Albertans. Early on, it was decided that this needed to be a unique and innovative facility to match the qualities of this special organization and its students.

DIALOG was engaged to provide architectural and engineering design services for the new building. The vision for this facility aligns very well with DIALOG's core values, which include meaningfully improving the wellbeing of our communities and making a difference for Albertans. As the first new building for the college in about 50 years, NorQuest desired an imaginative and exciting design, but most importantly, they required one that met all of the needs of their students and staff and reflected the college's spirit.

DIALOG worked closely with the College in the Schematic Design phase to establish guiding principles for the project. These principles would guide the design and inform decisions that were made throughout the project. Some of the key principles that were particularly applicable to the engineering teams included:

- Open, positive, inclusive and inviting atmosphere for learners, employees and public
- Learner centric: Meet the academic and social needs of NorQuest learners
- Environmentally conscientious, sustainable, energy efficient and socially responsible design
- Operationally cost efficient buildings
- Envision 108th street (Capital Boulevard) as the "front door" to campus
- Express innovation in design
- Maximize day lighting for improved student and staff performance
- Enhance connections between and within buildings

These principles helped guide the facility's, which in turn guided the engineering systems and design for the building.

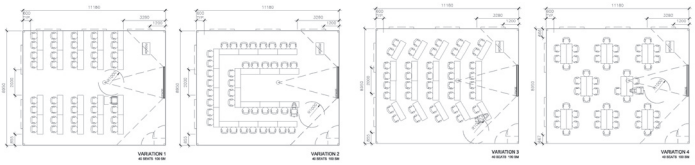
The SCFL is a world class facility that is the result of a highly collaborative and integrated approach to design and construction. The tight schedule presented a risk to the design team and contractor, but collaboratively we were able to meet the important deadline, and did so under budget. The building opened in September, 2017 for the start of fall term classes, as planned.

Architectural Design and Programming

The design of the building was focused around the unique program requirements of the diverse student population, as well as meeting the guiding principles. A “one size fits all” approach would not have worked here. The four story, 22,500 square metre learning center includes a variety of spaces that are flexible and functional for all who study and work there.

The dramatic entrance to NorQuest College’s downtown campus is designed to welcome students and the community. The bright and spacious lobby acts as a connection between the existing Heritage Tower and the new SCFL, as well as a public connection between 108 Street, the newly designated Capital Boulevard, and transit routes on 107 Street.

The SCFL features 40, 50 and 100 seat classrooms to enable unique educational opportunities that can be flexible over time with changing student needs. Key features involve reconfigurable classroom seating layouts, smart board technology, and provisions to accommodate active laptop-based learning environments.



To cater NorQuest College’s wonderfully diverse student population, distinct spaces were created that may not be found in other institutions. A Childcare Centre was included in the program, giving students and staff the amenity the ability to bring their child to school with them. The hours that single mothers were spending on transit taking their child to a distant day home can now be spent at home or at school. An early child learning outdoor terrace extends out to the south of the building, with ample space for learning, play and activities.

“These students are dedicated, committed individuals, some of whom have faced extraordinary challenges to get here to get an education. They just need a little help to cross the finish line.”

Sheila Witwicky
Chair, 1000 Women advisory committee

An aboriginal student center is located on the east side of the building and is used as a gathering place and for cultural ceremonies. The lighting and ventilation systems in the space respond to specialty ceremony needs such as smudging.

Integrated Design (Project Team)

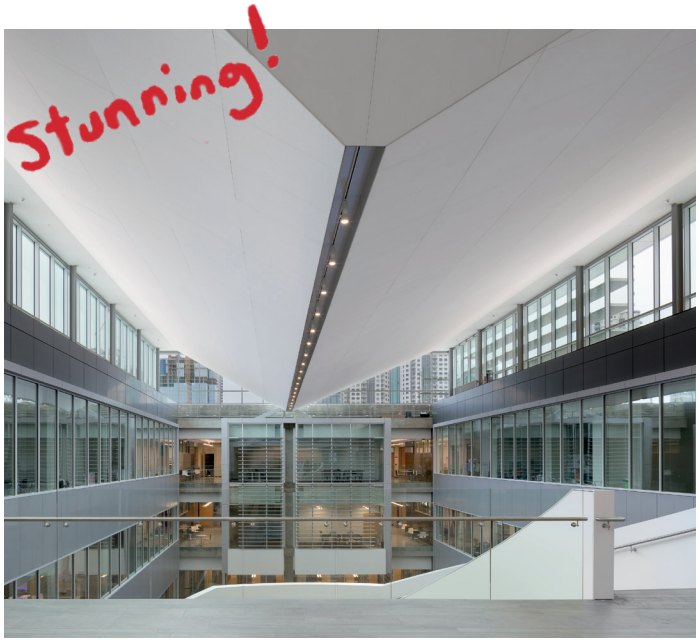
DIALOG were engaged by NorQuest to provide architectural and engineering design services for the new facility. DIALOG were selected as a result of our integrated design approach and our history of performing great work in this sector.

DIALOG provided the following consulting services, from design through construction:

- Architecture
- Structural Engineering
- Mechanical Engineering
- Electrical Engineering
- Landscape Architecture
- Interior Design

A collaborative approach to design was necessary to successfully execute this complex and highly technical project. Many engineering systems are left exposed and are expressed as part of the architecture. Imaginative and innovative approaches to detailing as well as interfacing between engineering systems and architectural finishes were critical to making this project a success.

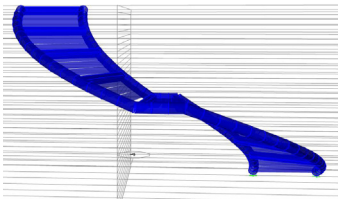
Our integrated approach helped identify and mitigate project risks from an early stage. Risk matrices were developed and populated periodically to help address risks early on and promote awareness of these issues.



Atrium and Feature Stair Design

FEATURE STAIRCASE

One of the challenges the design team was tasked to address by NorQuest was how to encourage building occupants to make better use of the stairs. The solution was to make the stair more prominent and to create a more inviting and engaging experience. At the west end of the central Learning Commons, the feature stair provides a sculptural focal point to the grand space. Visibility and access to daylight plays a major role in the design of the feature circular stair.



- The curved feature stair is the primary means of vertical movement between floors at the College.
- The curved stair is framed using hollow steel circular tubing, curved and sloped to profile. The steel hollow sections support a folded steel plate which in turn supports the granite treads.
- Circular shaped stringers were selected for their inherently high torsional and bending resistance, but were also important for ensuring a consistent and uniform connection detail for interfacing steel members, treads and handrails. Using a rectangular or square sections for a curved and sloped structure would have resulted in a constantly varying and ‘twisting” section, significantly complicating fabrication.
- The structural design of the stair included an assessment of its load carrying capacity, as well as its response to vibrations caused by walking or running.
- The feature stair responds to the guiding principles of open and inviting atmospheres, innovative design as well as enhancing connections within buildings.

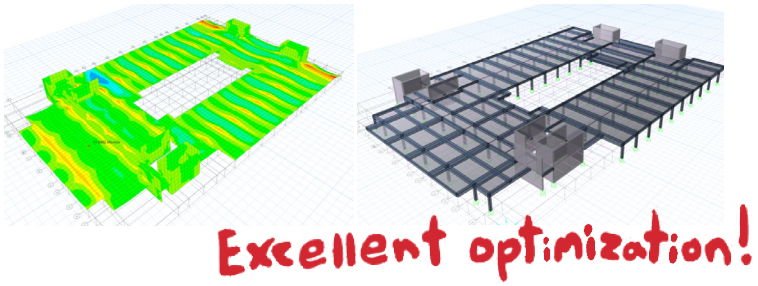
Structural Engineering

The structural systems for the SCFL consist of reinforced concrete and structural steel members. Material selection was a result of rigorous investigations during the schematic design phase. Several systems and materials were evaluated based on parameters including cost, constructability, durability, acoustical properties and fire rating. With these evaluations complete, the structural systems were selected following discussions with the client group.

The general structural system consists of one-way spanning slab and beams for the floors, with a structural steel roof for the penthouse, entrance lobby and atrium. There are also some select floor structures constructed using structural steel, including the feature stair and the pedway connecting the new SCFL to the existing building to the south. Some key structural design challenges included the design of the expansive concrete floor system and the design of the entrance lobby roof.

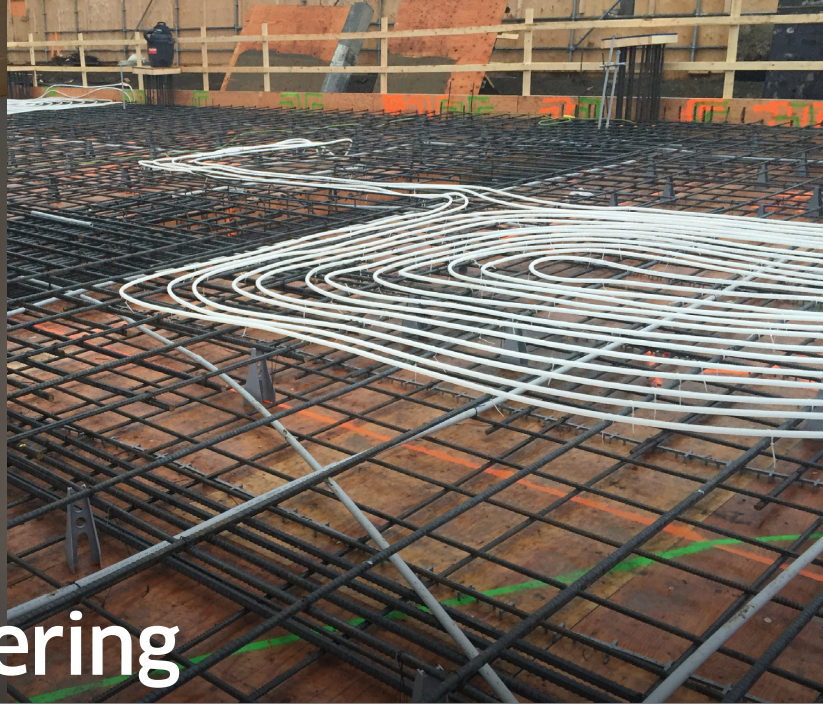
The floor system can generally be characterized by two span conditions; firstly, the very repetitive and consistent 12m x 6m bays on the east side of the building. Secondly, the more randomized bays ranging in area from 9m x 9m to 3m x 7.5m in area on the west side. Over five levels, the floor structure consists of a significant volume of concrete and reinforcing. Finite element models were created for each level capturing the different loading conditions, ranging from classroom live loading to library stack room to mechanical penthouse. Any efficiencies identified in the analysis and design would translate into significant savings when applied over all floor levels.

For this reason structural members were repeatedly optimized through a rigorous design process to help reduce structural costs.



The entrance lobby structure is constructed using structural steel, and consists of a roof that extends significantly past the west face of the lobby. The structure cantilevers more than 10m past the supporting steel columns, and covers the main entrance to the new facility from 108 street (Capital Boulevard). This welcoming and uplifting design feature responds to the guiding principle of envisioning 108 street as the “front door” to campus as well as innovative design. The cantilever roof is formed with tapered steel W-sections, supported by a steel truss along the building edge. The roof is subjected to significant snow and wind forces, a consequence of its position on site between the two larger structures. The roof is designed to resist these forces, while controlling swaying and vertical movements.

The entrance lobby also includes a steel pedway structure at the second level, which provides a connection between the new and existing college buildings, and responds to the guiding principle of enhancing connections between and within buildings.



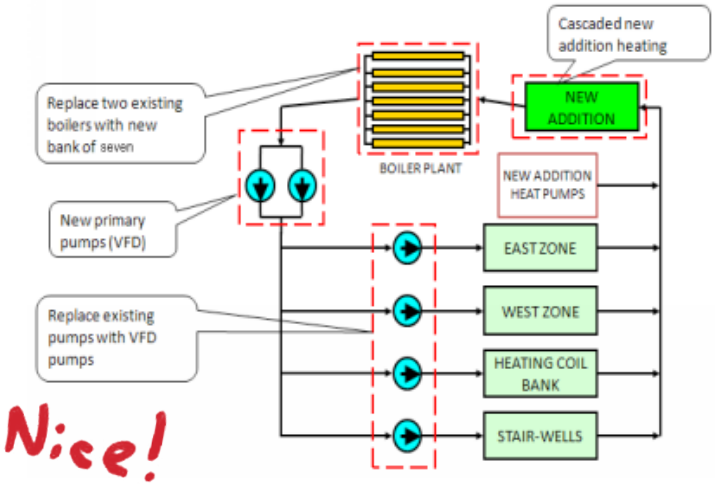
Mechanical Engineering

Mechanical systems have been selected to address the service needs generated by the program. They have been designed to reflect both the overall guiding principles as well as high indoor air quality, flexibility and an elegant design that fits into the overall aesthetics of the building. The high thermal properties of the exterior and strategic window to wall ratios reduce the effect of weather on the building interior, and ultimately providing energy savings.

The underlying design philosophy of the central heating plant was to renew, expand and reuse as much of the existing physical plant as possible rather than serve the new building with standalone plants. A new cooling plant was provided due to limited existing penthouse space. Since the heating plant is the highest energy use and operating cost of the facility, realized synergies from combined plants have the highest value of the life cycle of the facility. Redundancy is provided through a bank of seven boilers set up as a modular system. The old pumps were replaced with new pumps with variable frequency drives (VFD). The new primary loop distributes heating water to the existing building zones, then the return water circulates to systems in the SCL prior to returning to the boiler system. This cascades the higher temperature existing system with the new addition low temperature heating system resulting in a large temperature difference at the boiler plant and optimizes condensing boiler performance.

A combination of in-slab radiant, perimeter finned convection and overhead radiant heaters are integrated into the architectural design. The main floor atrium is tempered with a switchover low temperature radiant floor heating/cooling system which keeps the space open and free of extra mechanical equipment.

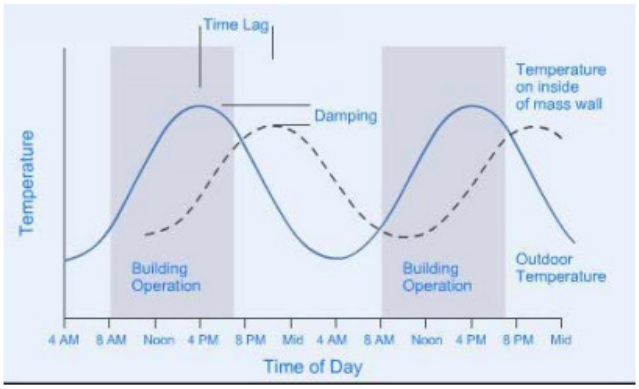
The ventilation system was selected based on a cost effective design, high ventilation effectiveness, low energy and flexibility. The system had to economically allow for classrooms to be converted to computer labs or office spaces to breakout spaces. Displacement with 100% outdoor air to the entire building serves both people ventilation loads and makeup air for exhaust. While this innovative system requires larger diffuser area, it has better removal of contaminants, and provides a higher comfort due to the low velocity of air to the space. Low velocity also means a quieter system, which made it ideal for the school learning atmosphere. Displacement ventilation has smaller airflows, reducing the amount of ductwork and allowing for increased ceiling heights and daylight to penetrate into the interior rooms. A raised floor was installed in the second floor and the diffusers are very adaptable to any new floor layouts.



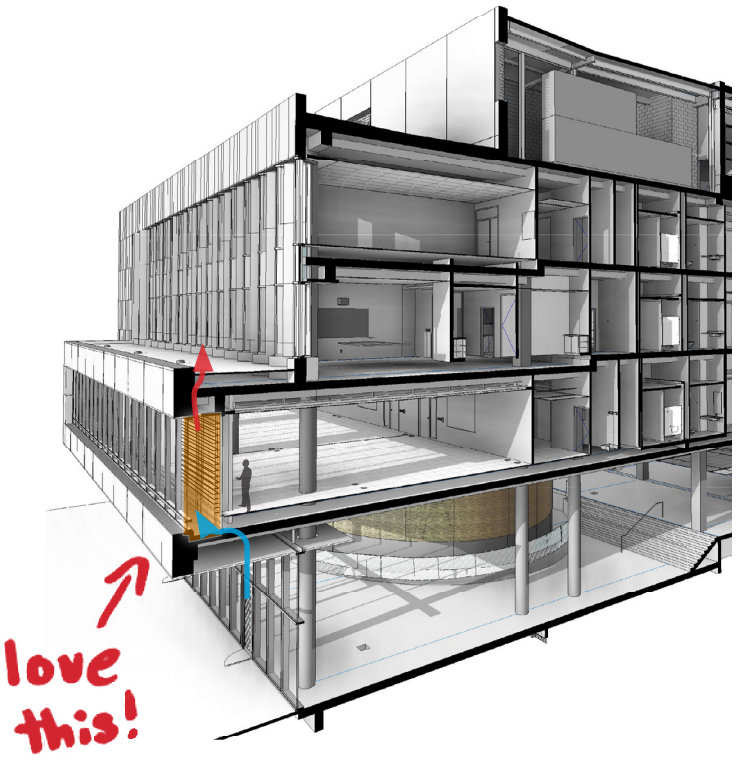
Sustainability

Many sustainable design features were incorporated into the SCFL. Decoupling the heating/cooling from the ventilation reduced the air volume required and allow for a 100% outdoor air displacement system. The exhaust and return air from the building is collected and brought through a heat recovery wheel in the air handling unit, passing heat and moisture to the incoming outdoor air. A portion of this exhaust air is then reused for the parkade makeup supply. This advanced system gets the most energy out of the outdoor air that is initially brought into the building.

The facility structural mass (poured concrete floors) presented an advantage from a space conditioning standpoint. There are fewer spikes in heating and cooling requirements, since mass slows the building response time. Thermal mass can shift some loads so that instead of superimposing, they are more spread out of a 24-hour cycle, with a resulting decrease in peak loads. Embedding radiant tubing in the floor structure allowed the mass to be pre-cooled at the end of each day in preparation for the next day's loads.



The evening sun shining in from the west can produce a large amount of heat within the building. To mitigate this, a dynamic buffer zone has been created outside of the second floor glazing. Fans inside the buffer zone turn on at low and high speeds to exhaust hot air from the space, thus lowering the amount of heat entering the classrooms.



The LED lighting fixtures that were included in the design also contribute to energy savings. Daylighting and occupancy controls turn off lighting and terminal boxes when not required, reducing interior cooling loads and fan power requirements.

Electrical Engineering

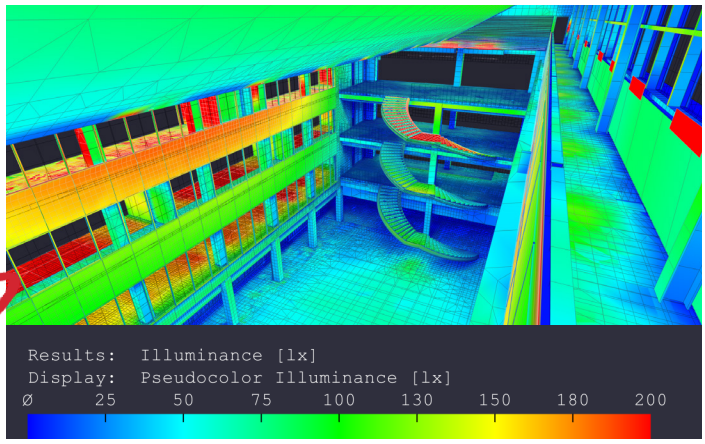
The electrical system design has been selected to address the service needs generated by the buildings' program, as well as allowing capacity for future expansion. It utilizes up-to-date technology, while giving due consideration to safety, flexibility, reliability, ease of maintenance, energy efficiency, and cost.

The electrical distribution system also accommodates the loading of existing buildings on campus, and is designed to provide additional expansion capabilities once other buildings are brought on-line. Housed within the facility is a single substation that consists of two utility feeders, coming from separate utility substations. If the primary feeder fails, the system switches to the standby feeder. The switchgear utilizes innovative microprocessor based fault protection systems, significantly reducing the risk of dangerous arc-flash hazards. In addition to the redundant utility sources, a diesel standby generator is implemented, providing emergency power in the event of total utility power failure. The generator capacity has been designed to supply both the SCFL and the South Learning Centre with standby power.

The installed system utilizes current power distribution technologies by expressing innovation in design, by increasing safety for maintenance staff, and by allowing future expansion of the NorQuest campus.

The lighting system in the SCFL is designed to give a comfortable, relaxed, and inviting atmosphere for students and staff, while providing adequate illumination and flexibility to meet the functional requirements of the facility. Modern LED technology is used to reduce operation and maintenance costs. Classroom lighting is designed to be both welcoming and functional. The use of dimming allows for maximum flexibility based on the task, and occupancy sensors turn off the lights when the room is unoccupied, further increasing energy savings.

The high atrium space is predominantly day-lit, with electric lighting supplementing as required. LED fixtures mounted at the catwalk are aimed to reflect off the atrium ceiling and down to the Learning Commons space. This arrangement allows for a diffused glow in the space, loosely emulating daylight. The decision to use the atrium ceiling as a 'daylight illuminance reflector' has influenced subsequent atrium designs on other projects as an efficient method to illuminate these spaces.



Great job!

Closing and Milestones

The new NorQuest SCFL has been designed considering the unique and inspiring students and staff that will occupy it. The Guiding Principles, established early in the design process, have helped guide the building programming and layout. This programming has in turn guided the engineering systems, and has driven the highly technical, innovative and imaginative design. The result is a truly outstanding building that will serve generations of students and make a real difference in our community.

Key Milestones

JAN, 2010
DIALOG engaged by NorQuest College

JUL, 2010
Schematic design phase complete

MAY, 2014
Design development phase complete

NOV, 2014
Building renamed the Singhmar Centre for Learning

JUN, 2015
Construction begins

SEP, 2017
Building opened for the Fall 2017 term

NORQUEST FACTS

NorQuest serves over **15,000** full-time and part-time **students** per year

The average NorQuest graduate will see a **$15,000 increase in earnings**

58% of Norquest students are born outside of Canada

103 Languages are spoken on campus

64% of students are female

332 students use disability services

NorQuest has been helping learners **since 1965**

PROJECT BUDGET AND COSTS

$100 M	Project Budget at 100% CDs SCL and Loading Dock Addition
$89.9 M	Total Construction Cost
3.2%	Project Change Orders due to Design Discrepancies