SUSTAINABLE BUILDING CHALLENGE
tiiSBE11 CANADA

SB11 CALL FOR POSTER PRESENTATIONS

Project: Kwantlen Polytechnic University
Administration Building ‘C’ and Library Building ‘A’

Attn: Bob Bach
iiSBE Canada SB11 Call for Posters
c/o Energy Profiles Limited
295 The West Mall, suite 503
Etobicoke, ON
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B+H Bunting Coady Architects has been involved with several Student Services projects for Kwantlen University College in Surrey, Richmond and Cloverdale. We enjoy working with a diverse group of stakeholders, which include the client, user groups, students and faculty. Two project examples in which B+H BuntingCoady worked with Kwantlen University include Kwantlen Polytechnic University Administration Building ‘C’ and Kwantlen Polytechnic Library Building ‘A’.

Kwantlen Polytechnic University Administration Building ‘C’:
The new Administration Building for Kwantlen Polytechnic University in Surrey (C2) provides this campus with a unique and contemporary ‘front door’ through which to welcome and orient students and visitors. The entrance features a dramatic canopy with copper ringed oculus and wood soffit while the light-filled three storey atrium bridges the gap between the old and the new buildings. Bunting Coady Architect’s Integrated Design Process was used throughout to shape the building, coordinate flexible modular internal layouts and enhance the progressive sustainable building mandate. This striking facility is designed to LEED® Gold.
Kwantlen Polytechnic Library Building ‘A’:

Kwantlen Polytechnic Library Building ‘A’ is at the very heart of the Kwantlen Polytechnic University Surrey Campus. The two storey entrance and library renovation is the focal point of the interior quadrangle, providing a light, well ventilated space, dedicated to the pursuit of learning. The second floor of the revitalized glazed lobby provides a quiet, daylight filled, contemplative setting for private reading, while the versatile three storey south wing provides learning labs for interactive teaching, along with additional individual and group study areas.

Over 90% of all occupied spaces within this facility have views to the outdoors, to provide direct connectivity to the environment. This durable, flexible and efficient library is targeted LEED® Platinum and incorporates a wealth of sustainable design features to significantly reduce environmental impact.

Indoor air standards within the Kwantlen Library go well beyond the required provincial non-smoking requirement. Air systems are protected by gateway grills designed to capture dirt and particulates. Carbon dioxide monitoring systems have also been incorporated throughout the building, to detect elevated levels and increase fresh air to the building.

No chlorofluorocarbons (CFC’s), Halons or HCFC’s were used in the facility, although current legislation permits the use of HCFC’s in the USA and Canada until 2030. Only non- or low-VOC (volatile organic compound) emitting materials were used in interiors adhesives, sealants, paints, carpets, agrifibers and woods. 42% of materials used in the construction of this facility were regionally extracted within BC.
Project Name: Kwantlen Polytechnic University Administration Building ‘C’ and Kwantlen Polytechnic Library Building ‘A’.

Location: Surrey, BC

Both Projects were started in 2005.

Kwantlen Polytechnic University Administration Building ‘C’: Completion Phase 1, 2007, Phase 2, 2009
Kwantlen Polytechnic Library Building ‘A’: Completion 2009

Building Owner: (both projects)

Ms. Karen Hearn
Company: Kwantlen Polytechnic University
Address: Building C
12666 72nd Avenue 2nd Floor
Surrey, BC V3W 2M8
Phone: 604-599-2448
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Size:
Kwantlen Polytechnic University Administration Building ‘C’: 46,607 SF (4,330 M²)
Kwantlen Polytechnic Library Building ‘A’: 56,000 SF (5,200 M²)

Building Type/ use: Institutional

Envelope construction: 60% Window/Wall Typical

Roof Construction: R20

HVAC Description and Daylighting systems:
Natural Ventilation through trickle vents combined with chimneys provide 100% of ventilated air. All heating/cooling is in-slab radiant coupled with geo-thermal. Facades are designed to be self shading on the south to allow side wall only lighting through slots on the west, and clerestory features were modelled through eight options to achieve atrium and library lighting with daylight and without solar gain or glare.

For Kwantlen Polytechnic University Administration Building ‘C’: an Integrated Design Process was implemented to arrive at the following building system initiatives:

a) Exterior Walls:
Curtain wall glazing with operable windows and trickle vents on North, East and West façades. Rain screen walls with operable windows and trickle vents on the East, West and South façade. Sunshades on the South façade will allow winter sun in while shading the hot summer sun and protecting interior surfaces from glare. Consideration has been given to controlling the amount of glazing to on each façade to balance the factors of ample daylighting with potential heating and cooling loads. The Entrance Lobby off 72nd Avenue is fully glazed to maximize daylighting and provide an open dynamic entrance feature at the ceremonial front entrance to the campus.

b) Structure: The basic structure of the building is concrete slabs, columns and shear walls. The Structural Shear walls at the exit stairs and stone feature wall as well as the shear diaphragms of the concrete slabs and steel cross bracing at the atrium roof are coordinated into the overall Architectural design and layout.

c) Mechanical: Radiant slab heating and cooling is integrated within the structural slab. Trickle vents and operable windows for natural ventilation have been coordinated into the Architectural façade detailing. The locations of the operable windows and trickle vents allow for maximum flexibility of the potential design layouts. The atrium acts as a natural ventilation chimney to exhaust building air.

The focus of the Integrated Design Process was to develop innovative sustainable building strategies, fully cognizant of occupant comfort, cost and maintenance implications, and Kwantlen’s current and future energy saving initiatives. LEED® Assessment achieved a Gold Certification.

Actual or projected reduction in energy use from a reference building expressed as a percentage:
100% electrical hydro and purchased green power.

Actual or projected purchased energy use by energy source:
Kwantlen Polytechnic University Administration Building ‘C’: Ashrae 90.1-99= 65.9% better
Kwantlen Polytechnic Library Building ‘A’: Ashrae 90.1-99= 69% better
LIBRARY BUILDING ‘A’

Ground Floor
1. Foyer
2. Info Desk
3. Atrium
4. Casual Seating
5. Study
6. Stacks
7. Offices
8. Loading

Second Floor
1. Corridor
2. Casual Seating
3. Study
4. Stacks
5. Bridge
Natural light:
Daylight modeling was conducted to maximize natural light in the building through the design of the facades, interior layout and atrium.

Daylighting Analysis
An updated daylighting analysis of the new building was performed, the results of which are shown in the image. It can be seen that the angled ceiling of the atrium will provide increased illumination on the main level under the atrium. The model was modified to reflect updated architectural details of the atrium and the results were presented during the next stage of design.

Radiant Heating & Geo-thermal system
The new building uses a radiant heating/cooling system. The water pipes are embedded in the exposed concrete floor slabs and roof. The same system supplies heating and cooling to perimeter trickle-vents which supply fresh air to the building. The energy source for the radiant system is supplied by the geothermal field in the parking lot.

Wind tower Analysis
Computational Fluid Dynamics (CFD) modeling of the wind tower above the main atrium has been completed. A sample output can be seen in the image, which shows a cross section through the wind tower under design wind conditions (SW at 2.0 m/s with leeward apertures open). The air flow over the top of the tower induces negative pressure on the leeward side which draws air out of the building. Based on these models and considering several additional constraints, the optimum tilt angle of the wind tower roof would be at 50° up towards the NE.
Façade response to orientation:
North – against an existing building – no heat loss.
East – shaded by an adjacent building.
South – high glazing percentage to allow for passive heating in the winter but with extensive external shading responding to solar gain in the summer.
West – glazing is placed in a North/South orientation to reduce direct solar gain from the West. High performance glazing, wall and roof systems to reduce heat gains and losses.

Natural ventilation:
This is how ventilation is achieved in this building. Natural ventilation is an architectural system which utilizes the natural forces of nature to move air throughout the building (buoyancy, stack and wind pressures). This is one of the major factors driving the architectural design. Complex Computational Fluid Dynamics (CFD) modeling was conducted on the main wind tower (main atrium) so the top of the wind tower performs as aerodynamic as possible allowing natural wind patterns to pull air through the atrium.

Thermal mass:
This is one of the main reasons why we can reduce our mechanical system size/capacity. The thermal mass can absorb/store heat from solar during the winter (passive heating) and absorb heat during the day and release it during the night (night cooling – passive cooling). Thermal mass also allows for a high level of comfort by regulating the temperature swings in the building which keeps the building at a constant temperature.
The renovation and expansion for Kwantlen University College Surrey Library accommodates the pressing needs of an expanding educational program and envisions a re-establishment of the Library as the primary building on campus. Bringing the existing 3,200 sf library to a total of 8,300 sf, the new facility creates a physical manifestation of the Library’s vision statement: “a dynamic centre dedicated to successful learning”.

The renovation incorporates a complete remediation of the existing stucco envelope with a brick and metal clad rain screen envelope and replaces the existing entry with a revitalized two storey glazed lobby space incorporating a gallery and sitting area on the ground floor and a study “balcony” on the second floor.

This space has generous north glazing for visual transparency between the Library and the campus courtyard. Providing natural light and ventilation for the library, with a central three storey atrium, this space is envisioned as the “campus heart.” The atrium ground floor accommodates a 60 seat Learning Commons and provides a transition space between the renovated two storey north wing library spaces and the new three storey West wing planned for stacks and quiet study spaces and the three storey flexible east wing planned for learning labs, group and individual study spaces.

The main design intent for this building is to perform as passively as possible (environmentally responsive design). The first step in achieving this is to study the microclimate of the site. We have installed a weather station that allows us to analyze the local climate so our design can respond according (the engineering “mimicry”).

The main challenge is to make the architecture and the environment work for us not against us. In other words, the major factor that provides interior thermal comfort, high level of indoor air quality and natural light for this building are the architectural systems. If a building can perform passively, energy saving become inherent to the design. After all passive design solutions have been exhausted; highly efficient “semi-passive” engineering systems were applied. In other words, engineering systems were selected to match the passive nature of the building and used to only supplement what the passive architectural cannot achieve.
Located in front of the existing Administration Building, the new Administration Building serves as an expression of the expanded and enhanced Kwantlen University College Surrey Campus to both students and visitors. The prominent location and significant presence of the new Administration Building on 72nd Avenue provides Kwantlen with a new front door to the Campus that functions to welcome and orient students and visitors to its Student Services, offices and classrooms. The Building and adjacent Atrium establishes and reinforces the connection to the central campus courtyard around which the existing Library, classroom and office buildings are arranged.

The Administration Building serves the growing need for enhanced centralized Administration Services from Registration and Student Services to student and staff support spaces. The three main areas of building design are; 1) Registration and Student Services 2) the atrium and 3) the office or classrooms spaces.
The new Atrium space (page 12) is located between the existing Administration Building C and the new Administration Building. It functions as a year-round gathering place and sheltered access corridor as well as an extension of Student Registration and Student Services. To enhance the nature of the atrium as a student and staff gathering place it includes features such as coffee service, casual seating and landscape screening elements between the existing offices and the new atrium space. Two bridge walkways connect the existing and new Administration buildings on the second floor. The roof structure and interior walls use wood elements to add character and warmth. The goal for the atrium is to provide a comfortable space for students and staff that enhance the performance and function of the new and existing Administration buildings. The Atrium enclosure is designed with selected areas of high performance glass walls and sun shading to provide natural light while controlling heat gain.

The Administration Building has a central design principal flexibility of programmable space. To achieve this goal the building has been designed around a series of nine by nine meter modules arranged on either side of a three meter central corridor. The intention is that each module will be interchangeable as a classroom or as individual or flexible office spaces. In general, areas with a high density of people will work best on the North side of the building where the demand for cooling will be the lowest. The desire for ample day lighting throughout the building with consideration to heat and cooling loads has resulted in curtain wall on the North, and partial East and West façades, and windows in rain screen walls on the West-South exposure. The design intention is that internally the interchangeable modules can readily accommodate the building programming evolving over time.