



Vanier Hall and Faculty of Social Sciences Building, University of Ottawa

2014 CCE Award Submission

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Submitted to Canadian Consulting Engineer

Submitted by Halsall Associates

PROJECT SUMMARY

The University of Ottawa wanted the Faculty of Social Sciences in one location. Halsall was the structural engineer for the renovation of six-storey, 1950s building and new 15-storey tower addition. To maximize available space and allow for future campus development, the project features a 225-seat lecture theatre that dramatically cantilevers 12-meters out over a future public plaza. The building creates a prominent landmark for the University and is an iconic new addition to Ottawa's urban landscape.

INNOVATION

The University of Ottawa's Vanier Hall and Faculty of Social Sciences facility is a \$112.5M project, which included renovating the six-storey, 1950s-vintage Vanier Hall building (145,000 square feet) and adding a new 15-storey tower (277,700 square feet) to serve as home for the University's largest faculty, the Faculty of Social Sciences.

The new tower was designed by Diamond Schmitt Architects, in joint venture with KWC Architects, to efficiently occupy a marginal pie-shaped site at the edge of this dense urban campus.

The state-of-the-art building includes multimedia classrooms, student study and collaborative spaces, seminar and research rooms, faculty offices and a double-height reception hall with a green roof. It connects to the renovated Vanier Hall via multi-level bridges that span a five-storey, sky-lit atrium.

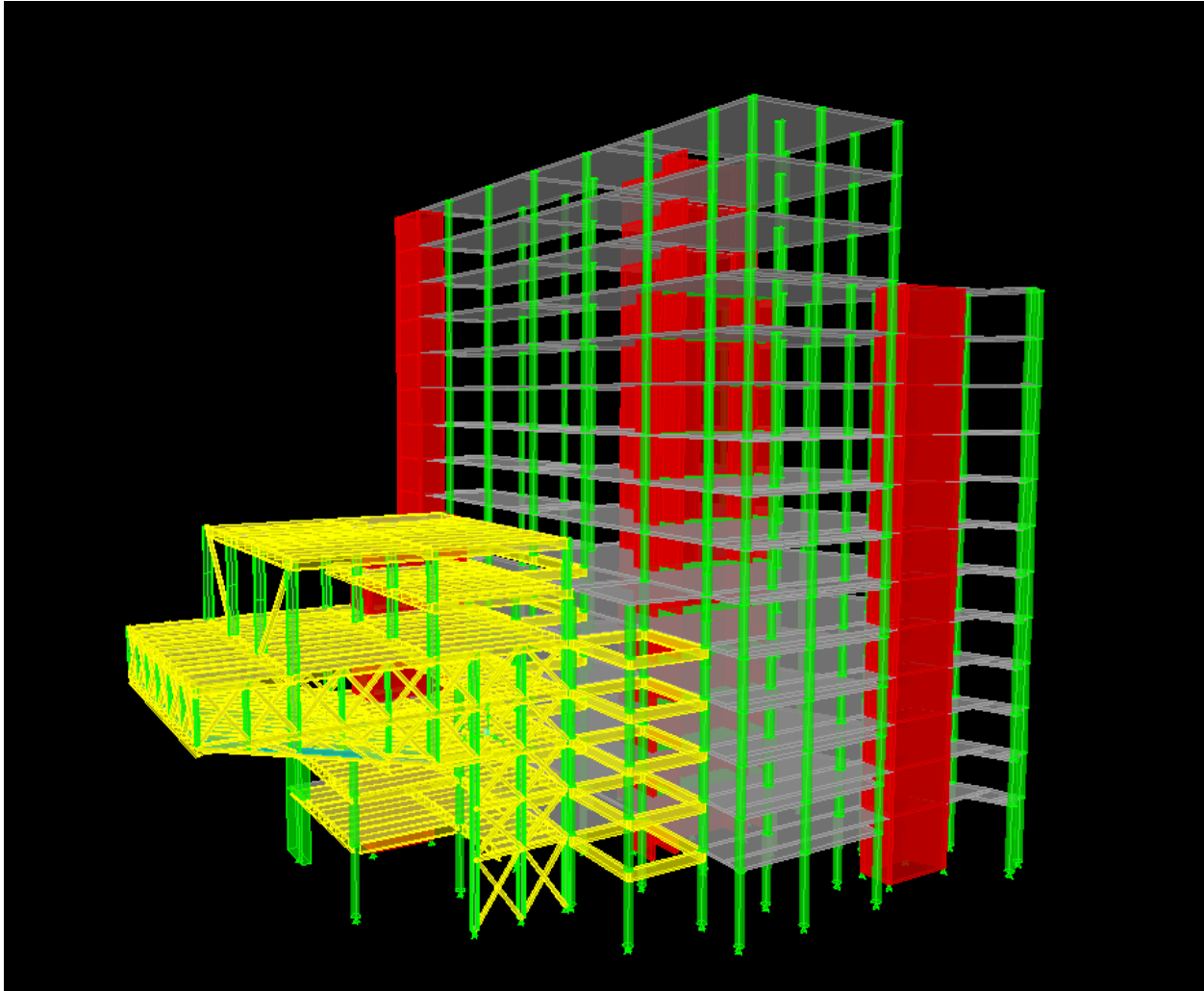
Designing the cantilevered structure to support the 225-seat theatre, plus a large multi-use meeting room above the theatre with a green roof, required a carefully-considered approach. It truly pushed the limits of what structural engineers can do.

The new tower uses a conventional cast-in-place concrete flat slab system with shear walls to resist lateral loads. This choice enabled the design team to minimize the typical depth of the structure. It also provided the best opportunity to tie into the floor levels of the existing Vanier Hall and still ensure reasonable ceiling spaces for services.





Aerial Rendering
KWC Architects / Diamond and Schmitt Architects.



ETABS Model

To create the 12-metre cantilever, the innovative solution was to construct storey-deep steel trusses to ring the perimeter of the lecture theatre with the bottom chord tapered up to form the theatre's tiered seating.

To resolve the cantilever forces into the concrete shear walls, the trusses were then anchored into the concrete structure utilizing a hybrid composite construction. The trusses are connected by a cranked, scoped steel grid which provides the framing for the composite slab floors. In all, over 850 tonnes of structural steel was used.

Transfer beams at the second-floor level eliminate the need for interior columns in a 120-seat classroom at the ground floor. Along the west side of the existing Vanier Hall, the new building incorporates a multi-storey atrium space.

The seismic design extended all the seismic force resisting elements down to foundations on the rock providing a substantial reduction in seismic forces on the building structure and creating a partial subbasement, which provided additional space for building utilities.

COMPLEXITY

One of the key challenges on this project was the need to protect the existing buildings, Data Center and surrounding service tunnels while constructing a new addition that goes both deeper and higher than the older buildings. Achieving this was complicated by the nature and location of the building site.

Ottawa is an area of moderate seismic hazard, so to optimize the seismic resistance of the new 15-storey tower; it made good sense to found the new addition's shear walls on the bedrock. However, the natural level of the site's rock is steeply sloped, and as it drops off, it changes from limestone to shale. In addition, being close to the Rideau Canal, the site's water table is relatively high – several meters above the rock.

To overcome these challenges, Halsall designed the foundations as a waterproof tank with anchorage to the rock to resist hydrostatic uplift. To avoid settlement in the surrounding buildings and service tunnels due to permanent lowering of the water table, Halsall conceived an elaborate excavation bracing system, using a marine engineering cofferdam approach. Halsall also designed a hybrid foundation structure transitioning to piles at the deepest part of the site with different piles to suit the varying rock conditions. To maintain the integrity of the Data Center, the level of both vibration and the water table were carefully monitored throughout the entire process.



SOCIAL AND ECONOMIC BENEFITS

The new multi-level Faculty of Social Sciences Building creates a prominent, eye-catching landmark for the University and is an iconic new addition to Ottawa's urban landscape. It serves as a gateway from the city and is strategically important to the development of the inner campus.

Situated immediately beside the Ottawa Transit way and the Rideau Canal, the building creates a terminus to the Grand Allée, a major pedestrian route through the campus. At the same time, the curved glass prow on the 'flatiron' form announces a new gateway to the Rideau Canal and the neighbourhood across the water.

The Social Sciences Building was designed with the intent of producing a landmark building befitting its prominent location and its significance for the University. It has set a high standard for future development in the area.

For the University, the expanded Vanier Hall and new Social Sciences Building bring together the nine departments, 10,000 students and 250 full-time personnel of the institution's largest faculty. "This is more than just a new building; it's a veritable social science laboratory," said Allan Rock, President and Vice-Chancellor of the University when the building opened in time for the start of the academic year. "Students and researchers in our largest faculty will benefit from the synergies that come with being together."

ENVIRONMENTAL BENEFITS

Vanier Hall and the new Faculty of Social Sciences project is currently a candidate for LEED Gold with the Canadian Green Building Council. Key features of the project are the six-storey high living wall (currently the tallest living wall in Canada), green roofs, extensive use of green materials and energy savings system.

Sustainable features included re-use of the existing building, energy recovery on ventilation system for animal areas and the modification of ventilation/exhaust systems for the existing animal area to accommodate energy recovery. The variable volume exhaust/supply system and full DDC control system reduces ventilation when space is not being used. Also, the new tower addition utilizes heat recovery chillers, low temperature heating, an evenly recovery exhaust/make-up air system with variable air flow, variable speed pumps, low flow plumbing fixtures and a high efficiency building envelope.



The cantilevered structure truly pushed the limits of what structural engineers can do.

MEETING CLIENT'S NEEDS

Create new home for the Faculty of Social Sciences

When the project started in 2006, the mandate was to maximize the limited space available in Vanier Hall through a renovation. By 2008, it became clear that Vanier Hall alone wouldn't give the University sufficient space to meet its growing needs. Thus a new plan emerged: Construct a new building on a narrow strip of land adjacent to Vanier Hall.

However, since the University sits in a downtown environment and in a moderate seismic zone, the only way to create more space was to build both up and out, over a yet-to-be-developed public plaza.

Allow Future Development

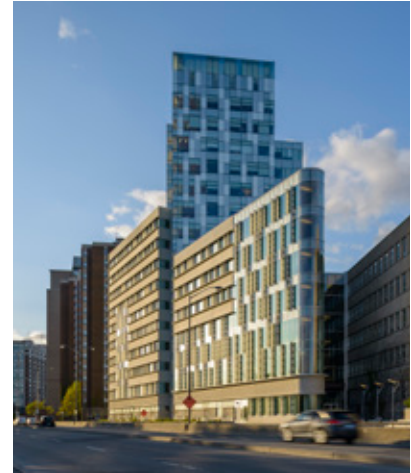
Pedestrian circulation is a key part of the University planning. The cantilever creates an interconnection between the interior and exterior that does not impede on the footprint of the future public plaza.

Maintain University's Central Data Center

Through a carefully phased construction sequence, computing services were able to continue operating in the existing building and were relocated to the new Data Center once the new building was complete and fully operational.

Client Satisfaction

Claudio Brun del Re, Executive Director Physical Resources Service University of Ottawa wrote, "We confirm that the structural engineering services of Halsall Associates for the project were completed to the full satisfaction of the University of Ottawa. We confirm that the overall objective of the project related to the structural aspects of the Faculty of Social Sciences/Vanier Hall was met within the approved time frame and budget."



The Faculty of Social Sciences Building is an iconic new addition to Ottawa's urban landscape