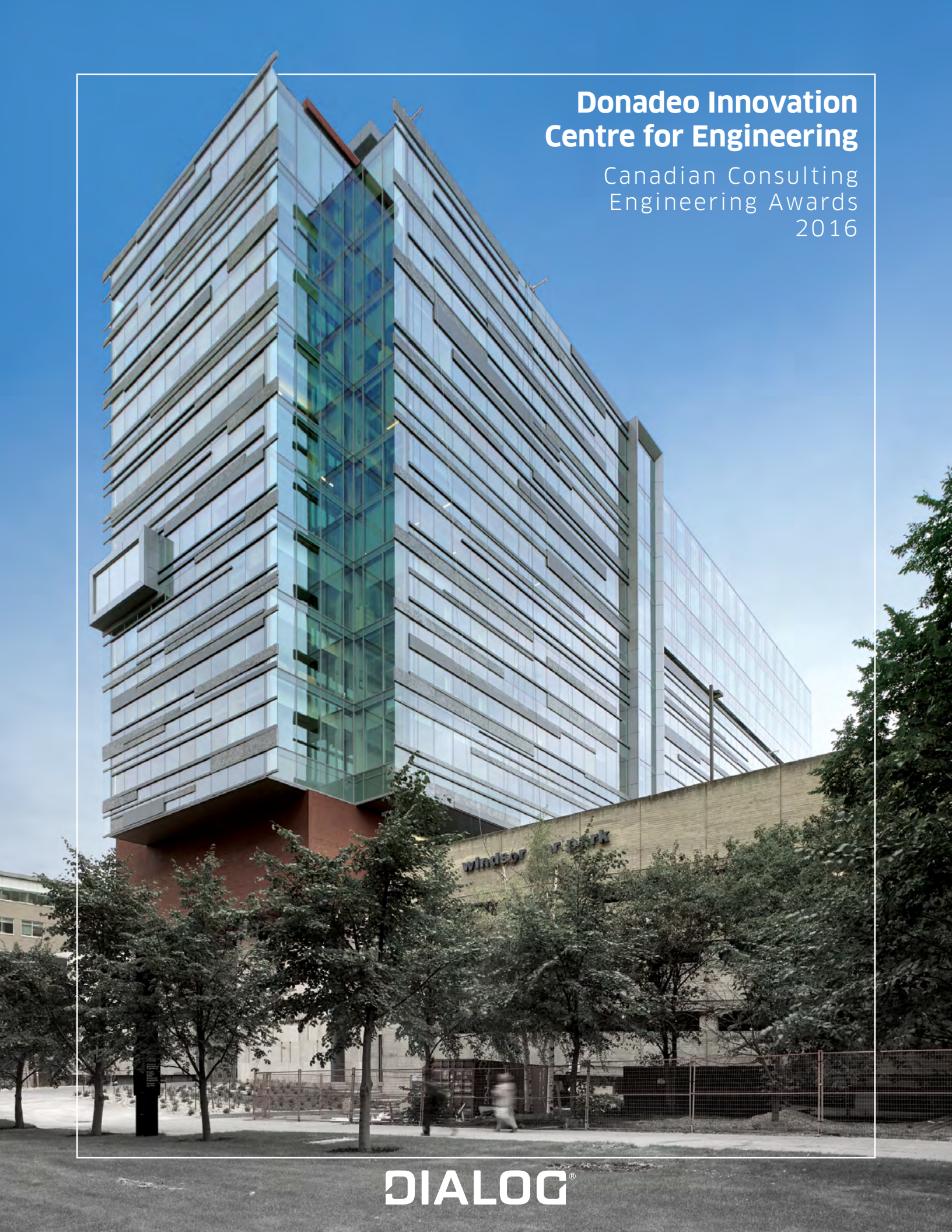
Donadeo Innovation Centre for Engineering

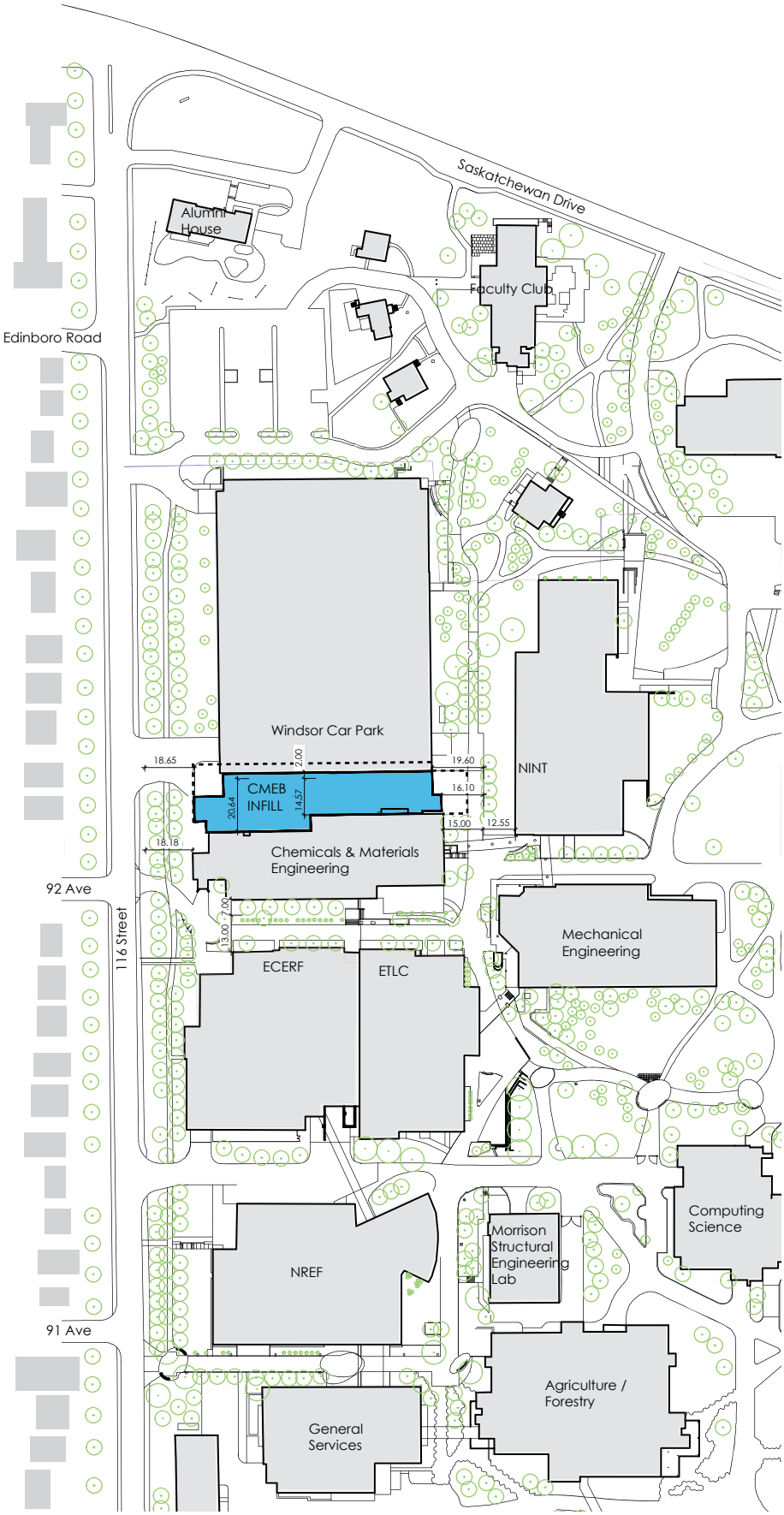
Canadian Consulting Engineering Awards 2016



DIALOG®

PROJECT SUMMARY

The Donadeo Innovation Centre for Engineering provides approximately 28,500 square meters of interdisciplinary office space, accommodating over 1,700 professors, students, and staff for the Faculty of Engineering. Built on a remarkable 16m wide sliver of land between two existing buildings, the facility frees up an area equivalent to the office space of the four existing campus buildings, and supports expanded educational and research activities for the Faculty of Engineering at a fraction of the cost.

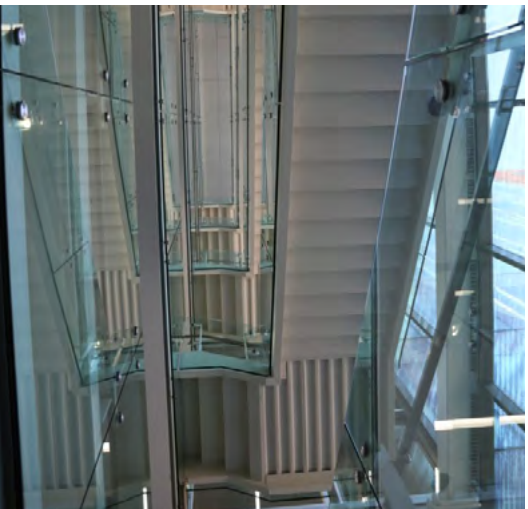


INNOVATION

The recently completed Donadeo Innovation Centre for Engineering (ICE) at the University of Alberta provides approximately 28,500 square meters of interdisciplinary office space accommodating over 1,700 professors, graduate students administration and support staff for the Faculty of Engineering. The construction of this facility frees up the equivalent area in 4 existing campus buildings to support expanded educational and research activities for the Faculty of Engineering at one third of the cost to build a new research and teaching facility.

The integrated team of architects and engineers from DIALOG and Hemisphere Engineering developed an innovative, unique approach the design of ICE in order to optimize the available space and deliver best value for the Faculty and University. The site for the new building was a small sliver of land between two existing buildings, the Chemical Materials Engineering (CME) building and the Windsor Carpark. The width between the two buildings, 16 meters, was not optimal or efficient for the intended use and did not create a large enough floor plate to accommodate the space needs of the Faculty of Engineering. To address these site constraints a unique building massing was developed. The upper levels of ICE cantilever north over the five-storey carpark and south over the eight storey research building to create functional, efficient floor plates thus optimizing the available space without impacting the limited green space in this sector of the campus.

The integrated design thinking also brought the structural and mechanical engineering systems and unique site services together in an innovative approach to building systems and life safety. The superstructure of ICE is structural steel typically enclosed in gypsum board or sprayed to achieve the required fire rating. An alternative solution was developed to achieve the equivalent fire rating using a dual sprinkler system supplied to two separate water sources. This approach enabled the structural steel system to be exposed, reduced the quantity of drywall and spray fire proofing and resulted in significant cost savings, a more maintainable building and an elegant visual vocabulary of exposed steel within the finished building.



COMPLEXITY

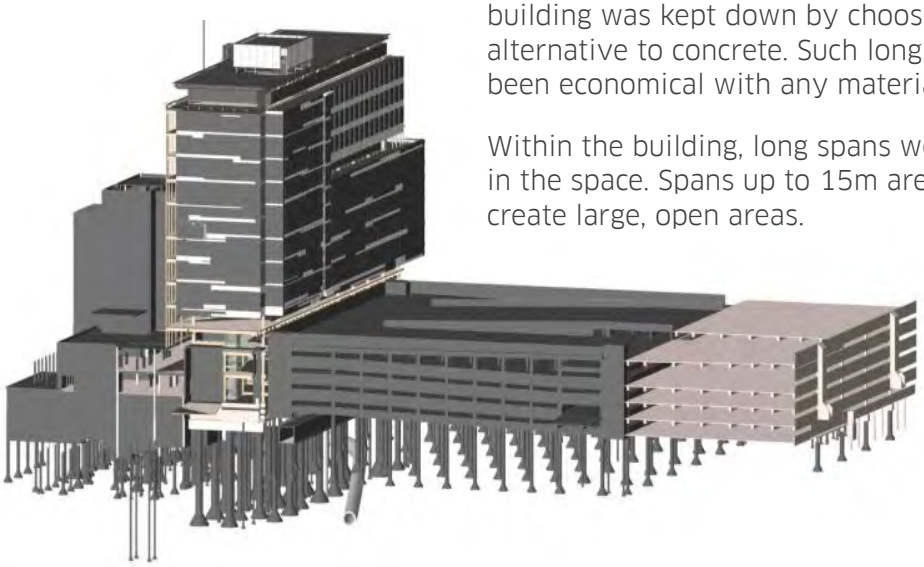
Due to the proximity of existing buildings, the project site presented significant challenges. Pilings could not be drilled at the building's perimeter as would normally be done, so the design team chose to inset the piles which then required a transfer beam to redirect the load.

Adding to the complexity of the narrow site, a host of existing utilities also had to be avoided. A deep sewer approximately 17m below grade traverses the northwest corner of the site. To avoid the risk of crushing the sewer, piles were founded at an elevation below the sewer. In order to clear the sewer, one pile needed to be moved off grid by 5.1m. A 2400mm x 3650mm deep cantilevered pile cap was used to transfer the column load from grid to the pile.

With such a narrow site, the design team sought to add as much square footage as possible. Starting at the pile caps and extending throughout the structure, the building cantilevers up to 6.4m on the east side and up to 4.5m on the north side, maximizing the size of each floor plate.

To help manage foundation costs, total overall weight of the building was kept down by choosing structural steel as a lighter alternative to concrete. Such long floor cantilevers would not have been economical with any material other than steel.

Within the building, long spans were sought to allow for flexibility in the space. Spans up to 15m are used throughout the building to create large, open areas.



“People thought we were crazy to build on a sliver of a parking lot.”

– Dr. Jim Montgomery, DIALOG Structural Engineer

ENVIORNMENTAL BENEFITS

The Donadeo Innovation Centre for Engineering (ICE) is designed to LEED Silver certification for Core and Shell development. Responsible construction practices coupled with several leading edge technologies will reduce resource and energy use, minimize environmental impact and improve indoor air quality.

Some examples:

Considerate land use: no green space is being lost with the construction of the new facility.

Fan Walls: Instead of using large energy-intensive fans to draw in fresh air it will employ Fan Wall technology that uses an array of smaller fans that operate at variable speeds, on demand. Energy use is dramatically reduced and maintenance costs are lowered significantly.

Chilled Beams: Chilled beams enable the heating and cooling of a building to be decoupled from its ventilation. Instead of air being used as the primary heating and cooling medium, water is used to heat or cool the air in the occupied spaces. This results in a significant reduction in the size of the main air handling equipment and its associated ducts throughout the building along with a significant reduction in the total annual amount of energy required to heat and cool the building.

Reducing hot water: the building utilizes heating water on-demand at the tap, saving on heating costs and eliminating the energy used to constantly pump hot water through a building.

Reducing water use: Low-flow bathroom fixtures will dramatically reduce water use. Overall water use is decreased by 40%

Motion-sensing light switches: motion-sensitive light switches automatically turn lights on and off throughout the facility.

SOCIAL AND ECONOMIC BENEFITS

The recently completed Donadeo Innovation Centre for Engineering (ICE) at the University of Alberta provides approximately 28,500 square meters of interdisciplinary office space accommodating over 1,700 professors, graduate students administration and support staff for the Faculty of Engineering. The construction of this facility frees up the equivalent area across four existing research and teaching facilities - the Natural Resources Engineering Building, the Electrical and Computer Engineering Building, the Engineering Teaching and Learning Facility and the Chemical Materials Engineering building. These four buildings have the floor loading and building systems to support advanced research and teaching. The use of 27,500 square meters of space within these facilities for office and administrative functions does not fully leverage the infrastructure in place to support research and teaching functions. By moving these functions to a building designed for office functions, the research buildings can be economically renovated to to support expanded educational and research activities for the Faculty of Engineering at one third of the cost and a fraction of the time to build a new research and teaching facility.

Bringing together faculty members and students from across multiple engineering departments into a single building will bring about a cultural shift, creating an atmosphere of even greater interdisciplinary collaboration in teaching, research and support. A new sense of community will grow and foster innovative partnerships. In addition, consolidating common departmental functions and space needs generates operational efficiencies that contribute to the financial sustainability of the Faculty.

MEETING CLIENT'S NEEDS

In February 2007, University of Alberta Dean of Engineering David Lynch and DIALOG engineer Jeff DiBattista were sharing a cab to the Vancouver Airport after meeting of the Canadian Engineering Accreditation Board. David asked for Jeff's opinion on an innovation idea: Could a small sliver of space between the Chemical and Materials Engineering building and Windsor Car Park be repurposed into a new faculty building by cantilevering it on stilts over the existing structures?

Jeff first thought to himself, "Wow, that's crazy. There's no room on the site." But as they pushed the thought experiment further they concluded that David's idea could be made real – it would just need a lot of smart structural engineering!

The completion of the Donadeo Innovation Centre for Engineering in fall 2015 and its innovative approach to campus planning and development is the culmination of over 15 years and 1.2 million square feet of investment in the future of the Faculty of Engineering. Research and teaching space is critical to the success of any University faculty. Research space is amongst the most expensive space to build. The Donadeo ICE project is a unique approach to freeing up space within existing buildings already designed to support research activities by relocating office and administration space into a purpose built, lower cost office building. The new 14-storey building, the tallest structure on campus, is located on that 16m wide sliver of land just as envisioned by David during that cab ride back in 2007.