The image shows three dancers in black leotards performing on a stage. They are positioned in front of a large window that looks out onto a blue sky with white clouds. The dancers are in various dynamic poses. The central dancer is in a wide, low stance with arms extended. The dancer on the left is in a backbend, and the dancer on the right is in a high leg kick. The stage floor is dark and reflective, showing the silhouettes of the dancers. A dark rectangular box is overlaid on the right side of the image, containing white text.

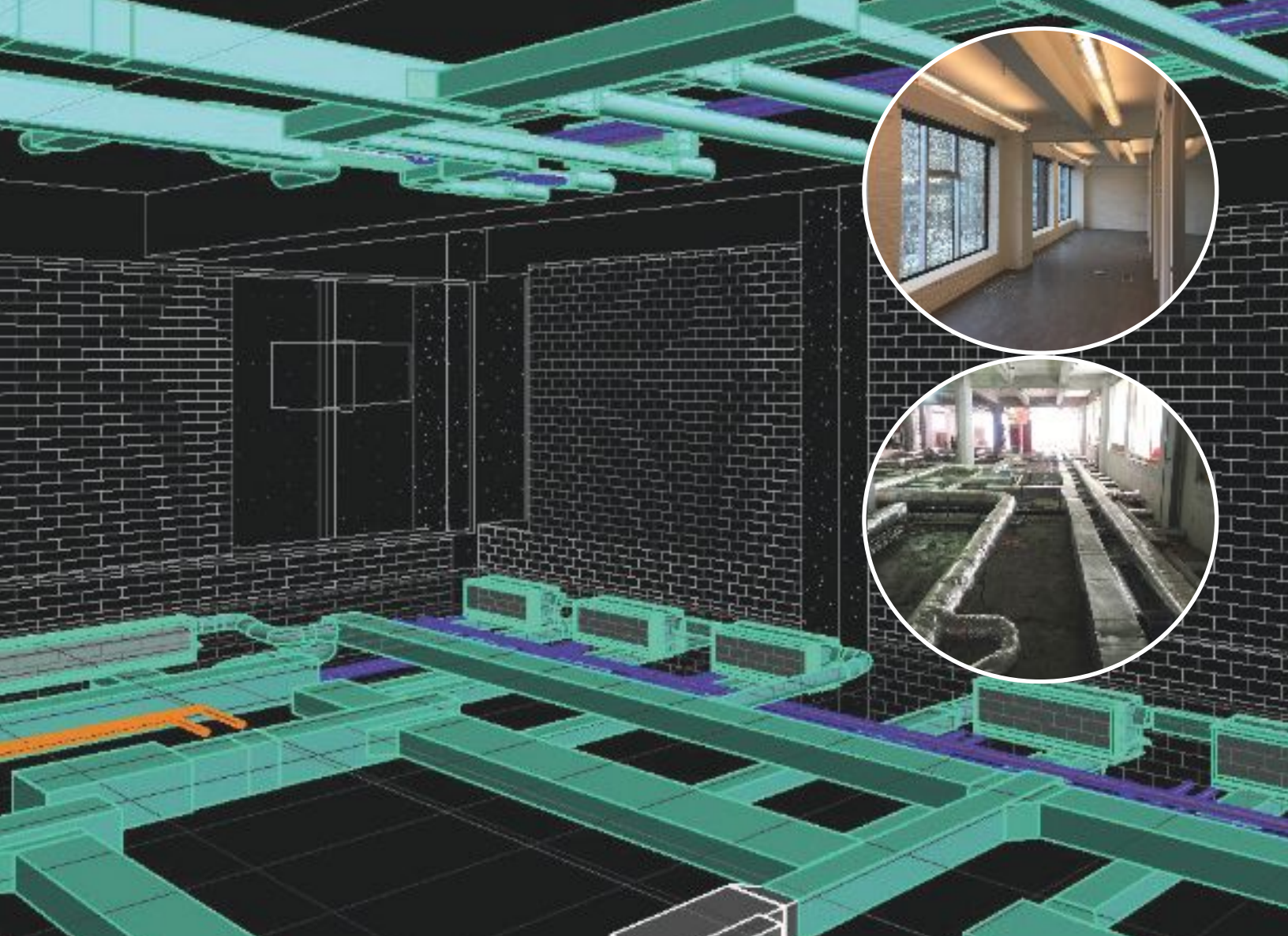
Transformation of the Wilder Building

Canadian Consulting Engineering Awards 2019
Category: Buildings

SNC-Lavalin Inc. | Bouthillette Parizeau

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Innovation

The Wilder-Espace Danse Building is the result of an ambitious project to retrofit an abandoned industrial building built in 1918, with a total surface area of 23 800 m². Quebec's Infrastructure Corporation (Société québécoise des infrastructures – SQI) launched this project to create a new home for Les Grands Ballets Canadiens, the École de danse contemporaine, Tangente, the Agora de la danse, Quebec's Culture and Communications Ministry, and the Quebec Council for the Arts. The existing building was renovated and new sections were added, each with different volume measurements and heights. To achieve this, we developed personalized solutions for each building section and ensured seamless integration to create a functional whole.

In the existing areas of the historic building, the challenge was to meet the project's needs despite significant architectural, urban and acoustic constraints, and in order to meet outstanding energy performance targets and LEED certification criteria.

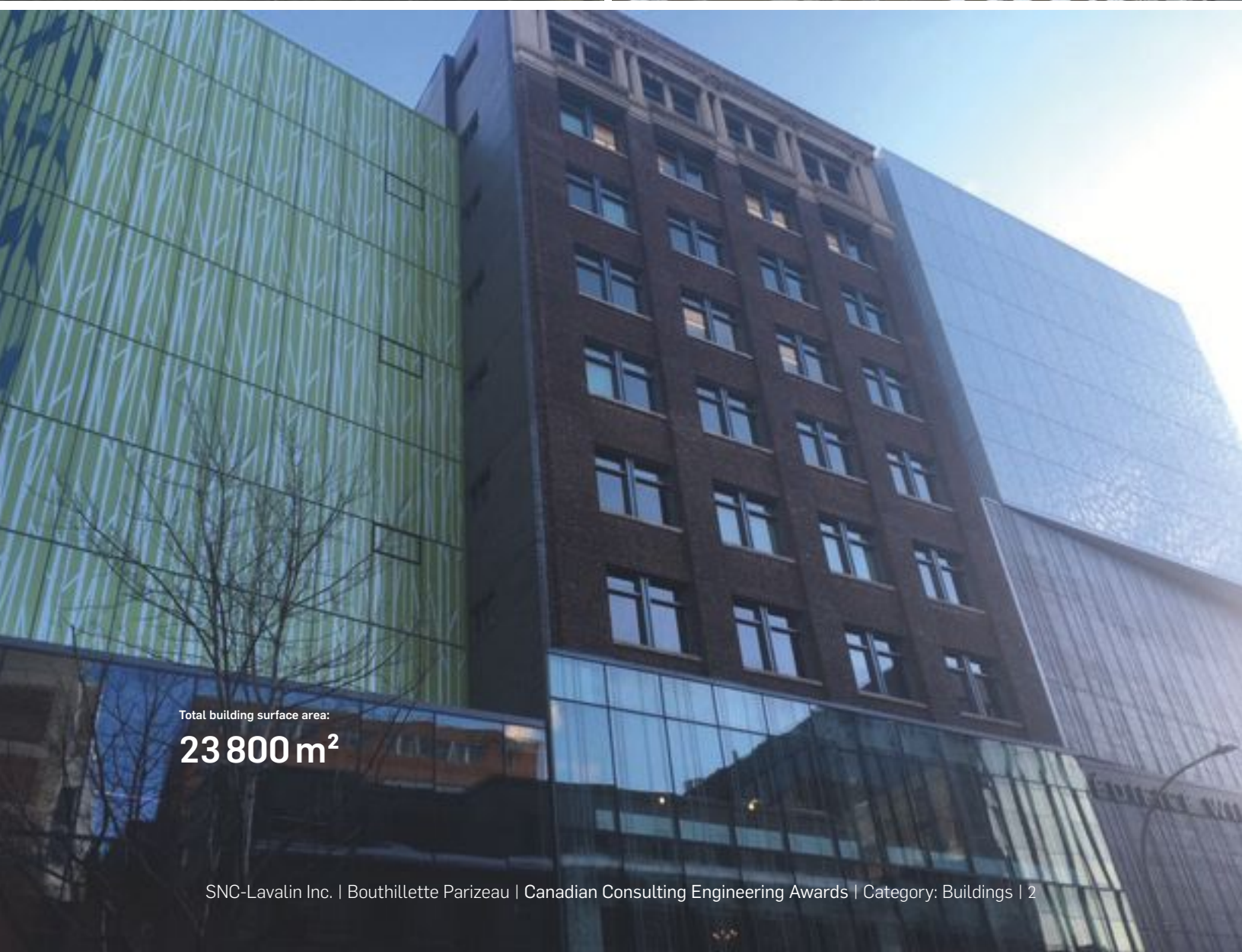
One of our team's innovative solutions was to use displacement ventilation (from the bottom of the room to the top) throughout the building's interior, recirculating air toward the elevated floor that served as a return air plenum. With this strategy, no ceiling ducts were needed, thus creating the impression of vertical height despite the limited slab-to-slab distance. For the building's periph-

ry, our team used induction to reduce the volume of circulated air by 80%, while maintaining optimal comfort for the building's users. An additional innovative idea was to combine both systems onto a single centralized air distribution system. This unusual solution helped minimize the space needed for mechanical rooms. The induction units are powered by a single piping network capable of alternating between low-temperature heating water and chilled water for an efficient use of the investment. Meanwhile, the variable-flow heating system can accommodate a wide range of temperature differences (55oF) for improved system efficiency and less piping.

Because of the building's translucent walls and stage lighting systems, significant heat gains were expected. To meet the project's strict acoustic requirements, ventilation conduits were oversized by up to 400% to reduce air speed. Given these conditions, forced air heating systems were not considered. Instead, custom low-temperature heating cabinets were designed and concealed in the concrete.

Our lighting designers transformed the project's acoustic constraints into an opportunity to provide optimal visual comfort for the dancers. By using acoustic panels as reflectors and an indirect diffusion device, they designed an innovative, glare-free lighting system for practice studios.





Total building surface area:
23 800 m²

Complexity

This project was particularly complex due to the concurrence of various constraints. Our team transformed these constraints into opportunities by proposing personalized, adapted systems. The final result is an attractive, functional and efficient building.

Our designers successfully overcame the challenges associated with meeting high acoustic targets (NC-25) and increased HVAC demands. The innovative solutions outlined above resolved the issues related to the century-old building envelope's poor thermal resistance (R3.4 ft² · °F·h/BTU), and the heat gains caused by its many windows and substantial lighting loads.

Our designers also successfully dealt with the architectural challenges imposed by the three-metre ceiling height and utility-free ceiling requirement.

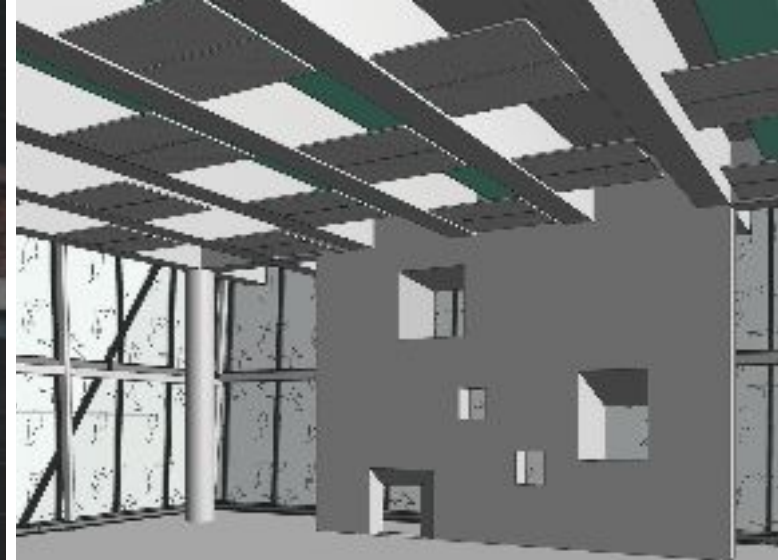
The footprint of the mechanical rooms and shafts was unusually small—62% smaller than a standard building. Finally, the building's location in the heart of Montreal's entertainment district (Quartier des spectacles) resulted in significant urban constraints, with no wall-mounted air inlets and outlets or rooftop equipment being permitted.

The project aimed for LEED Silver certification and a 34.1% reduction in energy consumption. One of the project's challenges was to achieve adequate energy performance despite the fact that there was no space for geothermal, aerothermal or other similar systems. Also, due to budgetary constraints, it was not possible to use heat recovery with the internal zones of the building, which made meeting the building performance targets that much more challenging—and exceptional.



4 organizations
danse studios

12 performance
halls



BIM – IDP = Building Integrated Modeling – Integrated Design Process



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Social and/or economic benefits

ALocated in the heart of Montreal's entertainment district (Quartier des spectacles), the Wilder Building houses four of Quebec's leading dance companies: Les Grands Ballets, Tangente, Agora de la danse, and École de danse contemporaine de Montréal. This unique space for artistic creation, performance, classes and practice boasts world-class dance facilities. By making Montreal more attractive to renowned choreographers and dancers, this building enhances the city's reputation as an arts and culture hotbed and its appeal as a tourist destination.

The Wilder Building is an extraordinary venue for the public to learn more about dance. Dancers from Les Grands Ballets offer nearly 30 classes, from classical ballet to hip hop, for participants of all levels. In addition, the Wilder Building

houses a national dance therapy centre for people with physical limitations, like Parkinson's. Finally, during the Agora de la danse's "Midi-coulisses," members of the public can watch dance rehearsals for free.

This groundbreaking project is one of the first provincial government buildings built using integrated BIM-PCI practices. With this approach, project stakeholders—including consultants—work together to develop integrated, optimal, innovative and sustainable solutions. On a socioeconomic level, we all benefit from the result: a high-quality, sustainable heritage building boasting annual energy savings of 28%.

Environmental benefits

Sustainability was a key factor in this project, which called for breathing new life into an abandoned building from 1918. Because the project was aiming for LEED Silver certification, our experts worked closely with the project's architects and structural engineers to design efficient systems that could offer ideal conditions for dancers, while meeting outstanding environmental efficiency targets and LEED certification criteria.

The building's performance is truly remarkable considering the existing building's constraints and the lack of space around the building and on the roof for renewable energy production systems.

Our team implemented the following electromechanical engineering solutions:

- Energy efficiency measures to reduce energy consumption by 34.1%, when compared with the ASHRAE 90.1 reference standard, including variable-flow ventilation systems, displacement ventilation in offices, heat wheels to preheat and prechill outside air (80% output), variable-speed circulating pumps, high-efficiency pump motors, water towers in winter used to cool the chilled water loop, resulting in free cooling and variable-speed fans in the water towers;
- A 35% reduction in drinking water consumption thanks to water savers and low-flow toilets;
- Design of an automatic control system to control and maintain ambient conditions according to the specific needs of the various building users.

Meeting Client's Needs

Exemplary comfort: The various building components were designed to provide total comfort to building users. The building envelope's loads are directly offset by its peripheral systems, providing optimal radiant temperature. The displacement ventilation system ensures comfort and well-being. Users greatly appreciate the air quality in the studios thanks to six air exchanges per hour. And, each room has individual controls and intelligent systems, enabling users to adjust ventilation levels at any time.

Energy efficiency and LEED certification: The updated building has achieved 34.1% energy savings as compared with the reference standard. These savings resulted in 10 LEED points and energy efficiency subsidies totaling \$250,000. Thanks to the professionals' combined efforts, the project was awarded LEED Silver certification.

Increased acoustic quality: Ventilation systems are critical for meeting acoustic requirements. Our innovative designs reduced air displacement speeds, resulting in exceptional acoustic quality (NC-25).

Simplified operations and maintenance: The layout of the equipment in the building's mechanical rooms had to ensure easy access for maintenance personnel. The systems are easy to understand and operate, guaranteeing lasting performance.

Respect of the schedule and budget: Despite all of the building's constraints, the design team identified solutions and opportunities to successfully overcome the project's challenges.