

Existing Building Upgrade Award
Lemay and Atelier 21

GRAND THÉÂTRE DE QUÉBEC: CONSERVATION & REHABILITATION

Quebec City, QC

Jury Comment

A sophisticated resolution of what had originally seemed an insurmountable technical challenge; that of conserving a deteriorating Brutalist concrete masterpiece and the built-in sculptures it contains. The glass veil preserves the character of the original building with a lightness of touch that is both

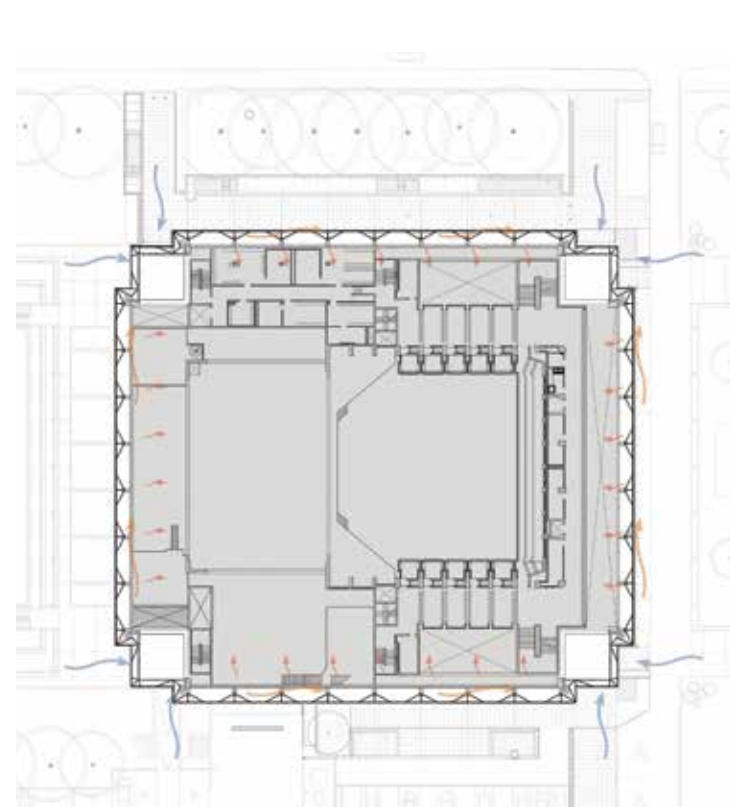
respectful and refreshing. Given the nationwide challenge we face in remediating and reusing so many buildings of this type, this project inspires us to embrace the challenge and simultaneously enrich the urban narrative.



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Bioclimatic plan

Fresh air is supplied at the four corners through new canopies located above the entrances. In the cavity, roof fans and a perimeter ventilation duct circulate the air around the facades so that the temperature is balanced. A low-flow heat recovery and thermal system provides energy efficiency.

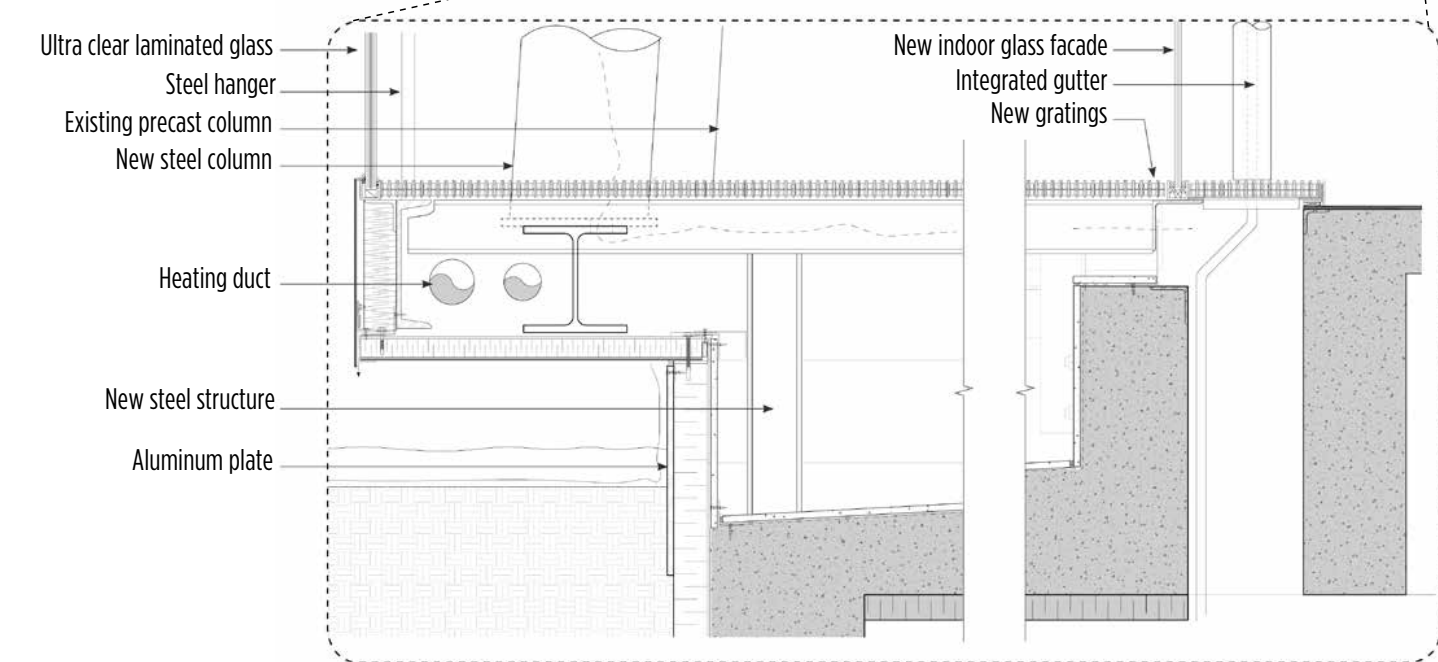
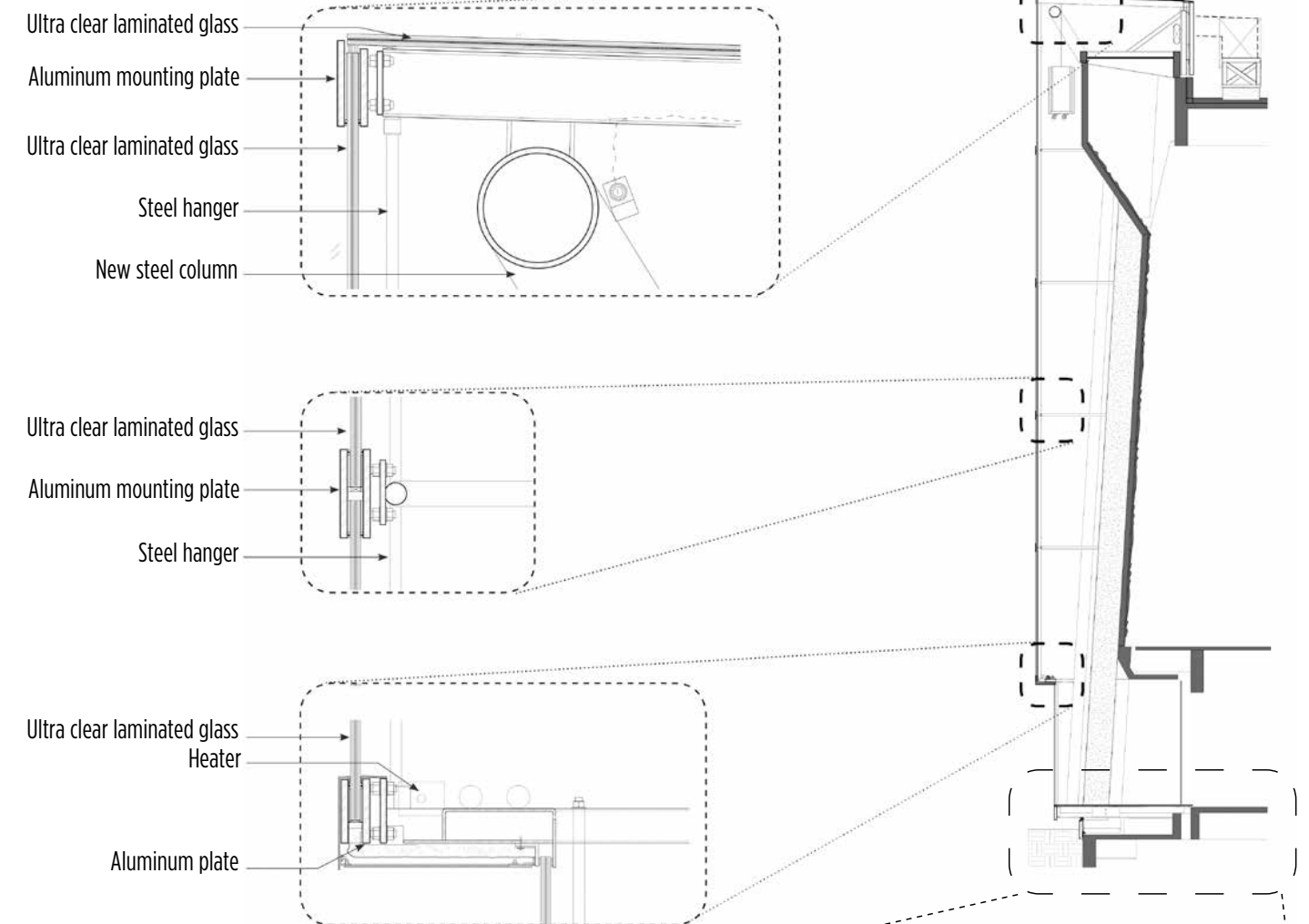
PROJECT CREDITS

- ARCHITECT** Lemay
- ASSOCIATE ARCHITECT** Atelier 21
- OWNER/DEVELOPER** Le Grand Théâtre de Québec
- CONSTRUCTION MANAGER** Pomerleau
- LANDSCAPE ARCHITECT** Lemay + Atelier 21
- CIVIL ENGINEER** WSP
- ELECTRICAL, MECHANICAL, STRUCTURAL ENGINEER** WSP
- COMMISSIONING AGENT** Ambioner
- OTHER** ELEMA, Metal Presto, Vitrierie Laberge
- PHOTOS** Stéphane Groleau

PROJECT PERFORMANCE

- Recycled materials** The steel used for the new exterior structure has 25% recycled content.
- Energy Intensity** With the addition of the tempered double envelope, the energy intensity increased from 235.9 KWh/m²/year to 241.6 KWh/m²/year, a 2.39% increase.

1. The new exterior prefabricated steel structure and glass infill panels have minimized the use of new materials, left the existing envelope untouched, and avoided invasive interior work.
2. Cleverly resting on the existing foundations, the steel framework reduced the use of concrete and site excavation.

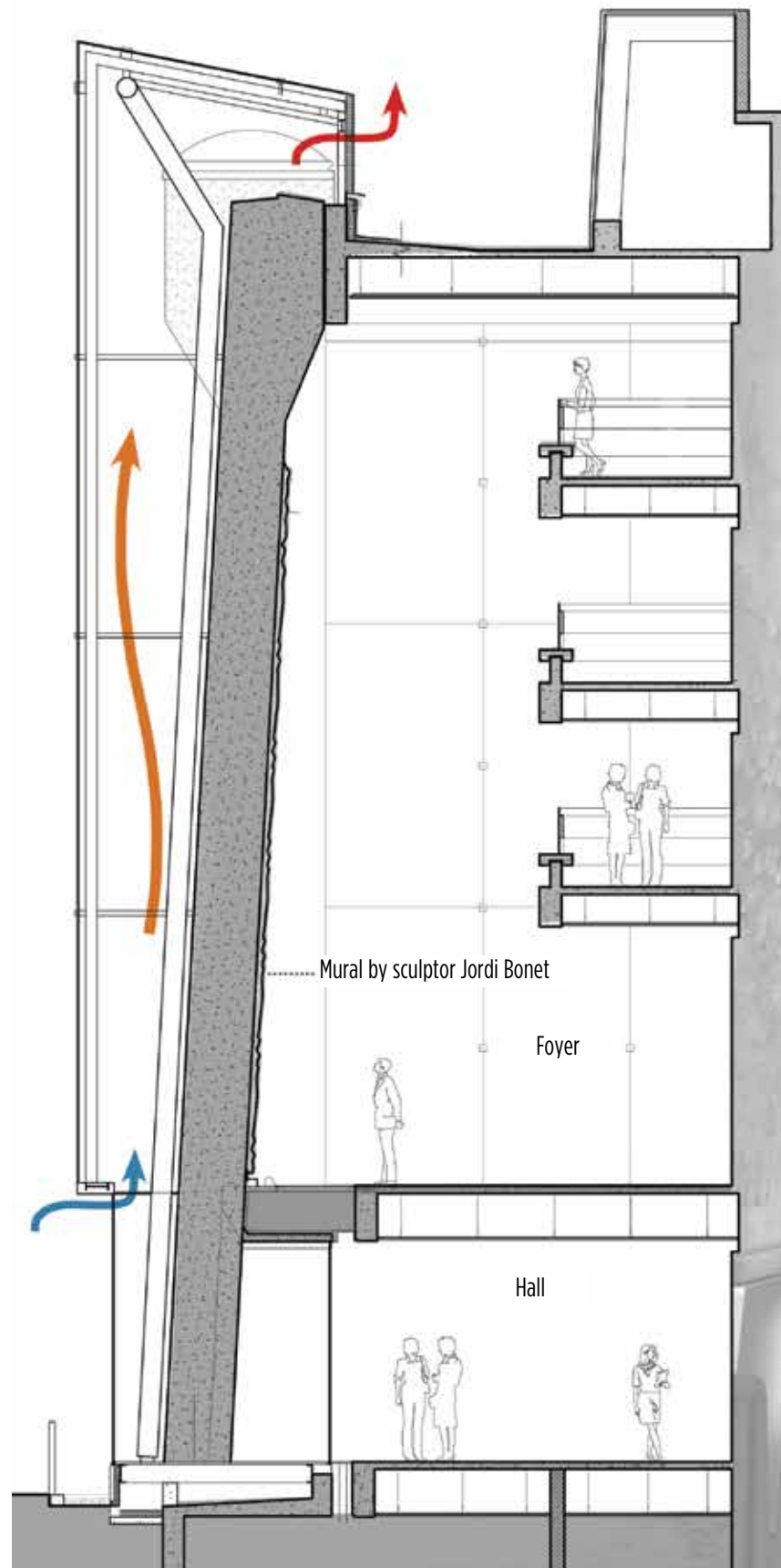


Construction detail

Famed for its brutalist architecture by Victor Prus and entwined with its historic, sculptural mural by Jordi Bonet, the Grand Théâtre de Québec is a prized cultural icon for all Québécois, inaugurated for the Confederation Centennial in 1971. Designed by prominent architect Victor Prus in the Brutalist style, prefabricated concrete interior and exterior walls are the defining architectural elements of the building. In addition, nearly 60% of the interior is covered with an integrated mural by sculptor Jordi Bonet

The existing prefabricated concrete envelope had major condensation and rust issues. The fragility of the mural and the inaccessibility of the concrete anchors required a radical solution. Adding a new glass envelope stopped the deterioration and significantly extended the service life.

Requiring only a prefabricated steel structure and glass infill panels, the solution minimized the use of new materials, left the existing envelope untouched and avoided invasive interior work. Cleverly resting on the existing foundations, the steel framework reduced the use of concrete and site excavation.



Design approach



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3. The approach to the main entrance.

The new glass envelope provides an innovative solution from an architectural, structural and mechanical point of view. It also dealt with logistical constraints, including the requirement that the theatre maintain its daytime and evening operations during construction. Noise could not impact rehearsals or performances and construction activity could not hinder building access. In addition, as the mural was connected to the exterior concrete panels, vibration and other potential impacts on the envelope had to be avoided. An integrated design and delivery process was essential to the success of the project.

The solution creates a new and independent structure that transfers its loads directly to the existing foundation walls using structural brackets, greatly reducing the loads on the building itself. The newly created air space between the exterior walls and the glass envelope eliminates the migration of exterior moisture through the concrete and, most importantly, halts its corrosive effects.

The new air space required tempering to ensure a dry and temperature-controlled environment, without condensation or freezing. The minimum air temperature is set to 5°C. Great efforts were made to limit the energy consumption of this newly added space.

The inter-disciplinary team went through a series of tests and adjustments to ensure perfect adaptation to the building's unique shape. This involved computer simulations and computational fluid dynamic (CFD) analysis, as well as energy simulations to balance the air temperature throughout the void.

4. The solution, a North American first, has arrested the physical deterioration of the building and preserved its heritage value.

5. The air space between the original exterior walls and the glass envelope eliminates the corrosive effects of exterior moisture migrating through the concrete.



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A mechanical system controls the conditions through hidden sensors, glycol pipes, unit heaters and vents. The required amount of air is introduced into the void from the corner soffits and is extracted by natural convection from modulated roof exhausts.

These simple mechanisms increase air flow in summer for cooling, while in winter, solar gain contributes much to the heating of the space. Considering the urgent need to arrest the physical deterioration of the building and preserve its heritage value, this intervention provided a minimalist, sustainable and respectful solution. Bold and innovative on several levels, this complex and delicate rescue operation is a North American first.