Ken Soble Tower

Hamilton, Ontario

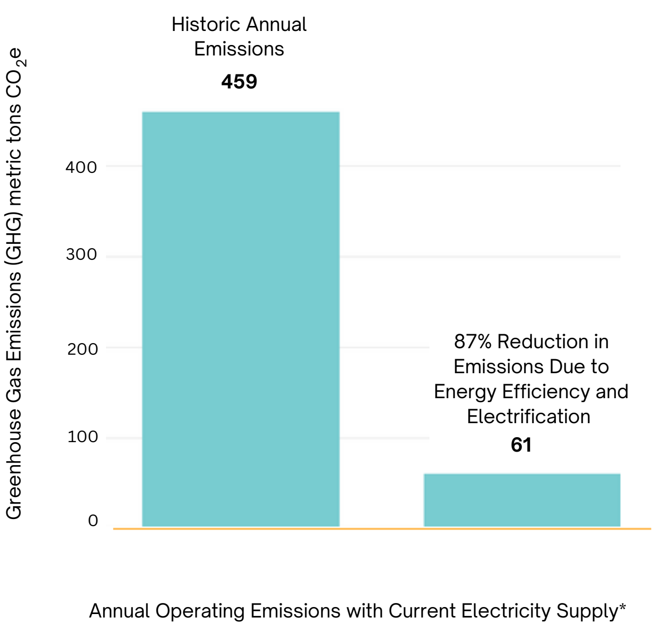
Ken Soble Tower, located in Hamilton, Ontario, is a deep energy retrofit of a 1967 tower. In 2020, this 18-story, affordable senior housing property underwent a passive house deep energy retrofit. This 80,000-square-foot public housing building is currently the world's largest residential EnerPHit passive house retrofit project and has cut its energy use by 76 percent.


Image: ERA Architects.

Ken Soble Tower, after renovations.

Achieving this involved a new electric mechanical system, wrapping the building in a new super-insulated shell using an exterior insulation finishing system (EIFS) with mineral wool insulation, new windows, and additional batt insulation on the interior.

Deep Energy Retrofit Analysis



*Annual operating emissions are calculated using Ontario based emissions factors for natural gas and electricity.

Energy reduction from energy efficiency and electrification	76 percent
Energy use intensity (EUI) before retrofit	138.5 kBtu/sf
EUI after retrofit	22.3 kBtu/sf
Greenhouse gas (GHG) emissions reduction with current electricity supply	87 percent


Image: ERA Architects.

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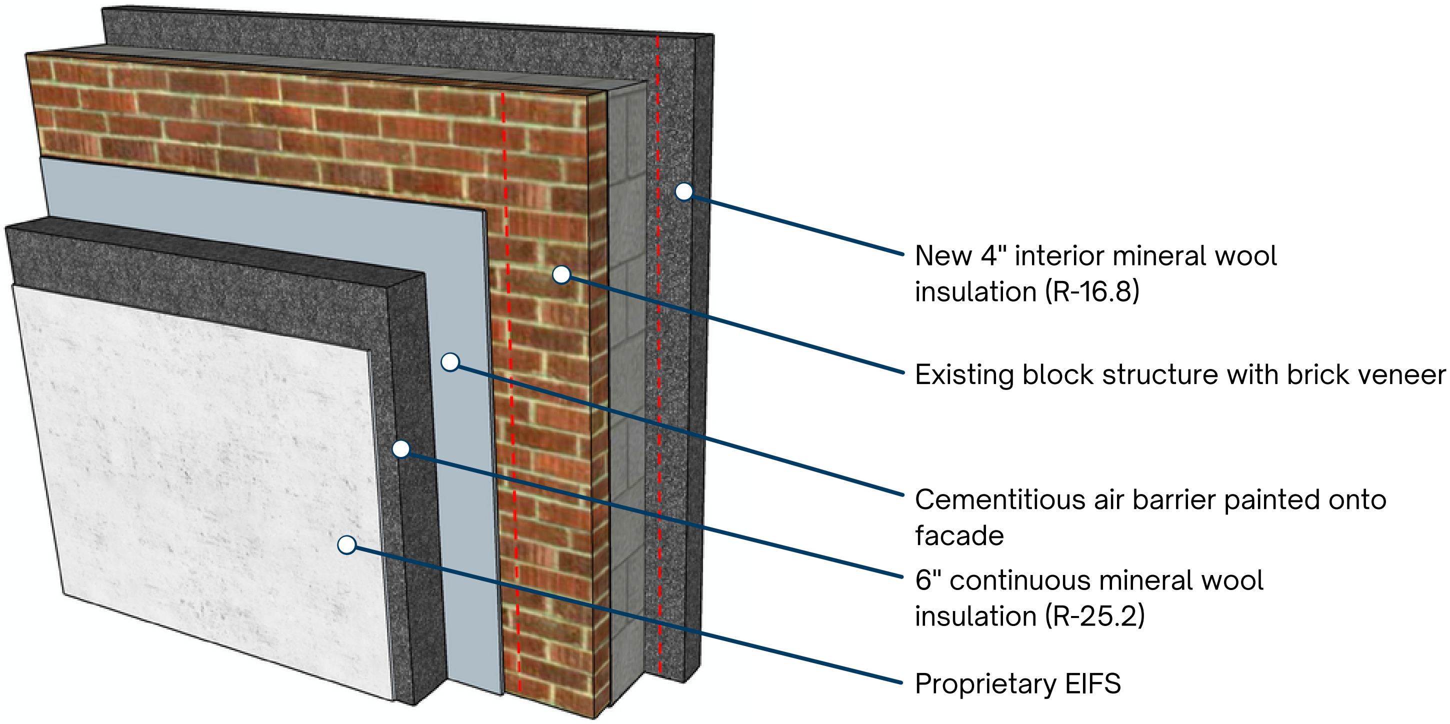
Building Envelope Strategy

Like many mid-century buildings, the existing exterior wall was concrete block with a brick veneer with limited mineral wool insulation. The building was experiencing deteriorating balcony slab edges, windows, and roof from water penetration over the years. The building was unoccupied at the time of the renovation since the interior drywall and insulation had to be removed due to mold. For this building and the site conditions, the most effective envelope strategy involved insulating both the interior and exterior sides of the walls. The interior was insulated with four inches of mineral wool (R-16.8), and the exterior of the building was wrapped with six inches of mineral wool insulation (R-25.2) and an EIFS treatment. Mineral wool was selected as the insulation to keep embodied carbon modest and combustibility risk low. At the time of construction, Ken Soble Tower was the first retrofit in Canada to use mineral wool EIFS on the façade, a patented system developed by DuROCK with exceptional fire resistance.

New Insulated Building Envelope (R-38 effective)



Building Overview

Project name	Ken Soble Tower
Building type	Multifamily residential
Location	Hamilton, Ontario
Year built	1967
Status of renovation	Completed 2021
Number of stories	18
Number of apartments	146
Floor area	82,369 square feet
Certifications	EnerPHit

Building Team

Building owner	City Housing Hamilton
Architect	ERA Architects
Mechanical engineer	Reinbold Engineering
Electrical engineer	Nemetz
Building scientist	Entuitive
Construction manager	PCL Constructors
Passive house consultant	JMV Consulting

Exterior Insulation Wall System

Wall Insulation	
R-value before	R-8.8
R-value after	R-38
Roof	
R-value before	R-10
R-value after	R-63
Windows	
U-value before	U-1.50
U-value after	U-0.12
Solar heat gain coefficient (SHGC) before	Unknown
SHGC after	0.32
Target Airtightness	0.23 ACH50

New triple-paned windows were set in the existing window openings and thermal bridging was eliminated at the existing balconies by removing them and creating "juliette" balconies. With oversized windows on the building exterior, the building team installed interior blackout blinds to reduce solar heat gain in the summer months. Resident education on how to operate the renovated homes and maximize energy efficiency has been especially important to achieving operating savings.

Construction on the exterior envelope including window and "Juliette" balcony installation (right). Interior view after construction (left).

Scope of Work

Interior Insulation (Walls)	Exterior Insulation (Walls)	Exterior Insulation (Roof)	Mechanicals	Solar PV
• 4 inch mineral wool (R-16.8)	• Cementitious air barrier • 6 inch mineral wool (R-25.2) • EIFS treatment	• Fluid applied polyurethane roof membrane • 400mm (4 layers of 100mm) extruded polystyrene (XPS) rigid insulation • Filter fabric • Riverstone gravel ballast	• Heating and Cooling: Central LG Multi V5 and VS air source heat pumps with electric resistance heat boost (on demand), in-suite electric variable air volume (VAV) systems • Ventilation: Central Swegon ERV system • Domestic Hot Water: Gas-fired system	• N/A

HVAC Strategy

Before the deep energy retrofit, Ken Soble Tower was uninhabitable because of deterioration, mold, and asbestos-laden materials. The new central systems include three large, electric Swegon units, one located at each the base of the building, the roof, and the annex building, all powered by heat pumps. This new HVAC system replaced an ineffective ventilation system that provided make-up air to the central corridors and then to individual apartments via an undercut of the apartment doors. Tempered, fresh air is provided to each apartment through the central system, with in-suite electric VAVs allowing for more variable demand control. Electric resistance is used as an additional heat boost. Unfortunately, due to an aging utility-owned transformer, the building could not support an all-electric domestic hot water system as the added load would have surpassed the transformer's peak capacity.

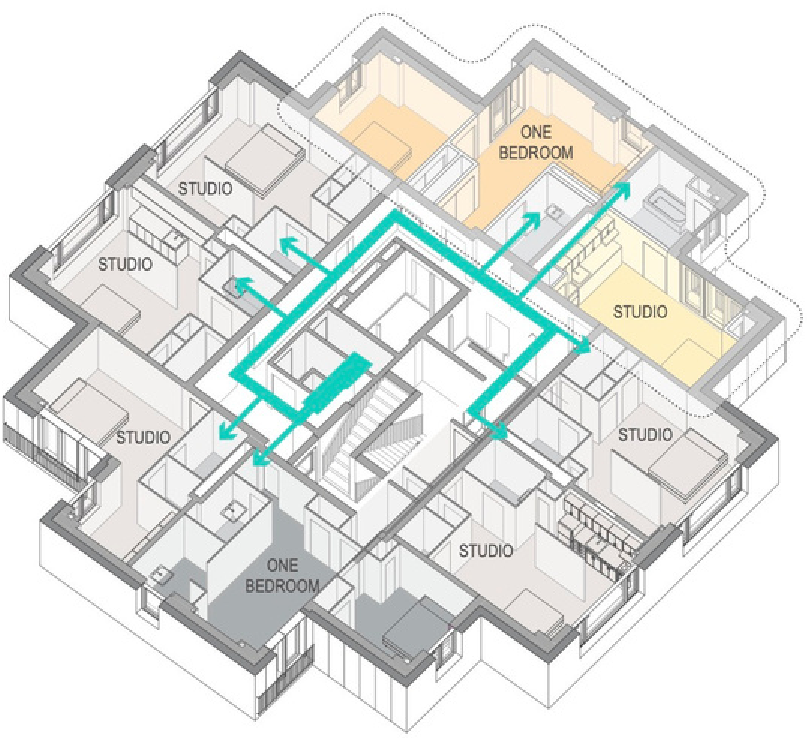


Diagram showing central ventilation supply design.

Image: ERA Architects.

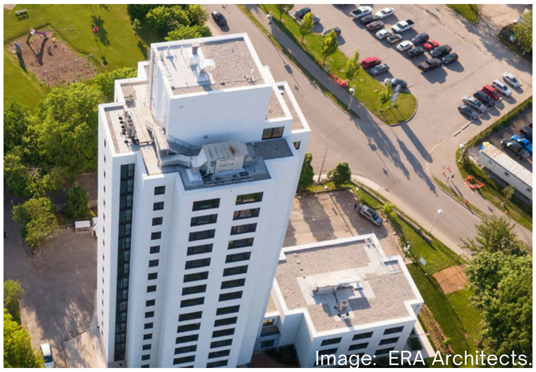


Image: ERA Architects.

Tenant Engagement

A portion of the energy savings depends on Ken Soble Tower residents. Residents control the heating and cooling of their units through their thermostat, operable windows, black out blinds, and ceiling fans. The property management team is working to educate residents on low-energy strategies to heat and cool their apartments efficiently. A large part of this working dynamic focuses on managing resident expectations through transparency and communication on project operations.

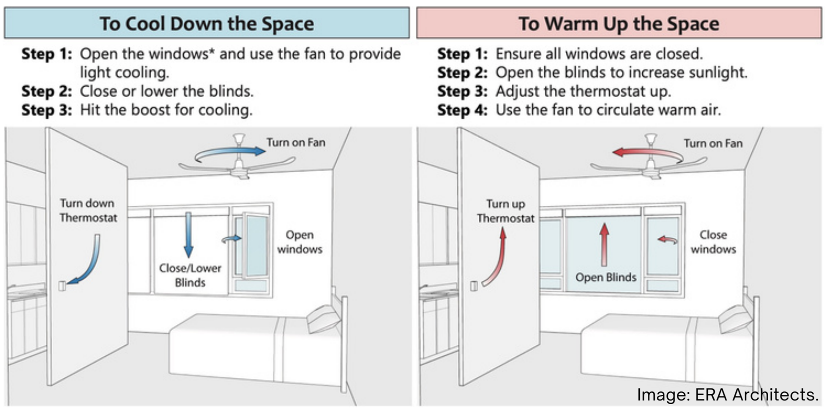


Image: ERA Architects.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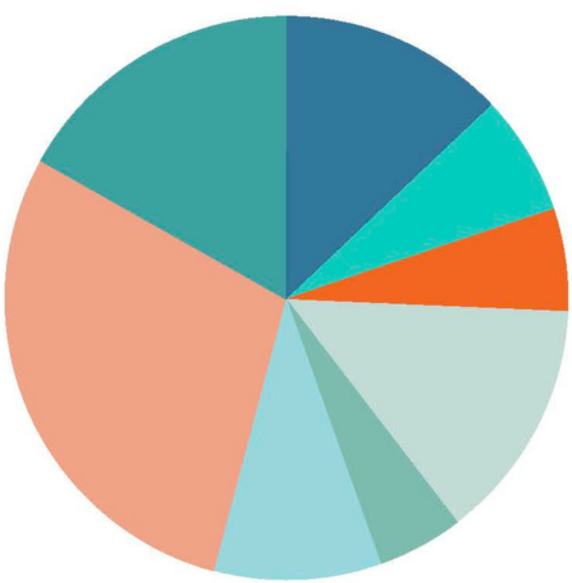
Cost Breakdown

Specific cost data was not available for this case study, however, the graphic below summarizes cost categories and their percent share of overall construction costs.



Objective	Percentage of Cost
Energy Efficiency	13.1%
Passive House Premium	7.1%
Accessibility and Social Inclusion	5.8%
Interior Fit Out	13.9%
Life Safety	4.8%
Mold and Asbestos	9.3%
State of Good Repair	29.3%
General Conditions and Fees	16.7%

Graph: "Ken Soble Tower Transformation" by Tower Renewal Partnership.

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