KEN SOBLE TOWER ENERPHIT RENEWAL
A CANADIAN FIRST

KEN SOBLE TOWER PASSIVE HOUSE RENEWAL

HAMILTON, ONTARIO

The Ken Soble EnerPHit Tower Renewal is a prototype for net-zero-ready, COVID-resilient housing renewal. A landmark project of the National Housing Strategy's Repair and Renewal Fund, the project is set to be North America's first Passive House high-rise residential retrofit. With performance standards testing local construction precision and Canadian low-energy equipment supply chains, the project showcases current possibilities, and points to where industry must go to enable the widespread retrofits required to address challenges of the 21st century.

The project renews a post-war apartment tower in Hamilton, Ontario to the Passive House EnerPHit standard, while creating best-in-class social housing for seniors. One of thousands of post-war apartment towers across Canada, the Ken Soble Tower is a demonstration project for the kind of tower renewal that is urgently needed to maintain thousands of affordable apartments across the country.

Built in 1967, the Ken Soble Tower is the oldest high-rise multi-residential building in CityHousing Hamilton's portfolio. A local landmark with significant community value, the tower had fallen into a state of disrepair, pest infestation, declining occupancy and increasing costs. This renewal project secures long-term asset viability, improves housing quality and indoor comfort for senior residents and reduces carbon emissions by 94%.

RESILIENCE THROUGH PERFORMANCE

At 18 storeys and more than 80,000 sqft, the Ken Soble Tower will be one of the largest EnerPHit certified projects in the world, and the first high-rise housing EnerPHit in North America. EnerPHit is the Passive House standard for retrofits, a rigorous European certification for net-zero-ready construction focused on occupant health and comfort. In meeting this standard, the total EUI for space heating and cooling is less than 25kWh/m2 with total project EUI anticipated to be less than 100 kWh/m2. The renewal is designed for a changing climate, using 2050 temperature projections to test thermal comfort into the future. If power and heat were lost on the coldest day of the year, residents could shelter in place for up to four days, as compared to four hours in a building adhering to the minimum requirements of the Ontario Building Code.

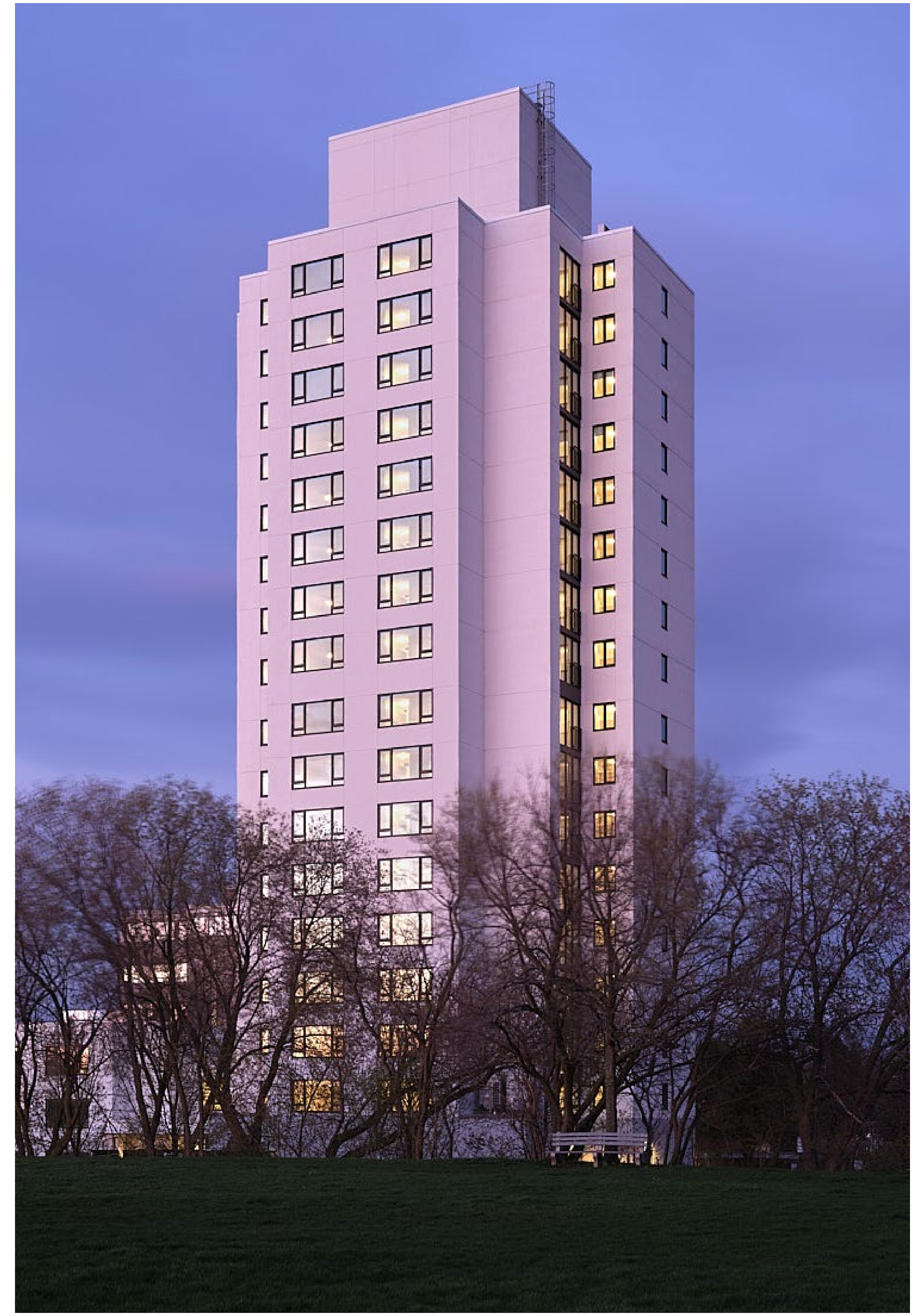
HEALTHY HOUSING

Designed for aging in place, the design introduces a new solarium with views over the harbour, barrier free suites, outdoor native planting and rain gardens, and high contrast wayfinding. Critical in this COVID-19 era, the design replaces inadequate ventilation systems with an innovative best-in-class system of direct suite ventilation, exhaust, filtration and heat recovery ensuring clean and fresh air, as well as large triple-glazed windows allowing for passive ventilation in shoulder months.

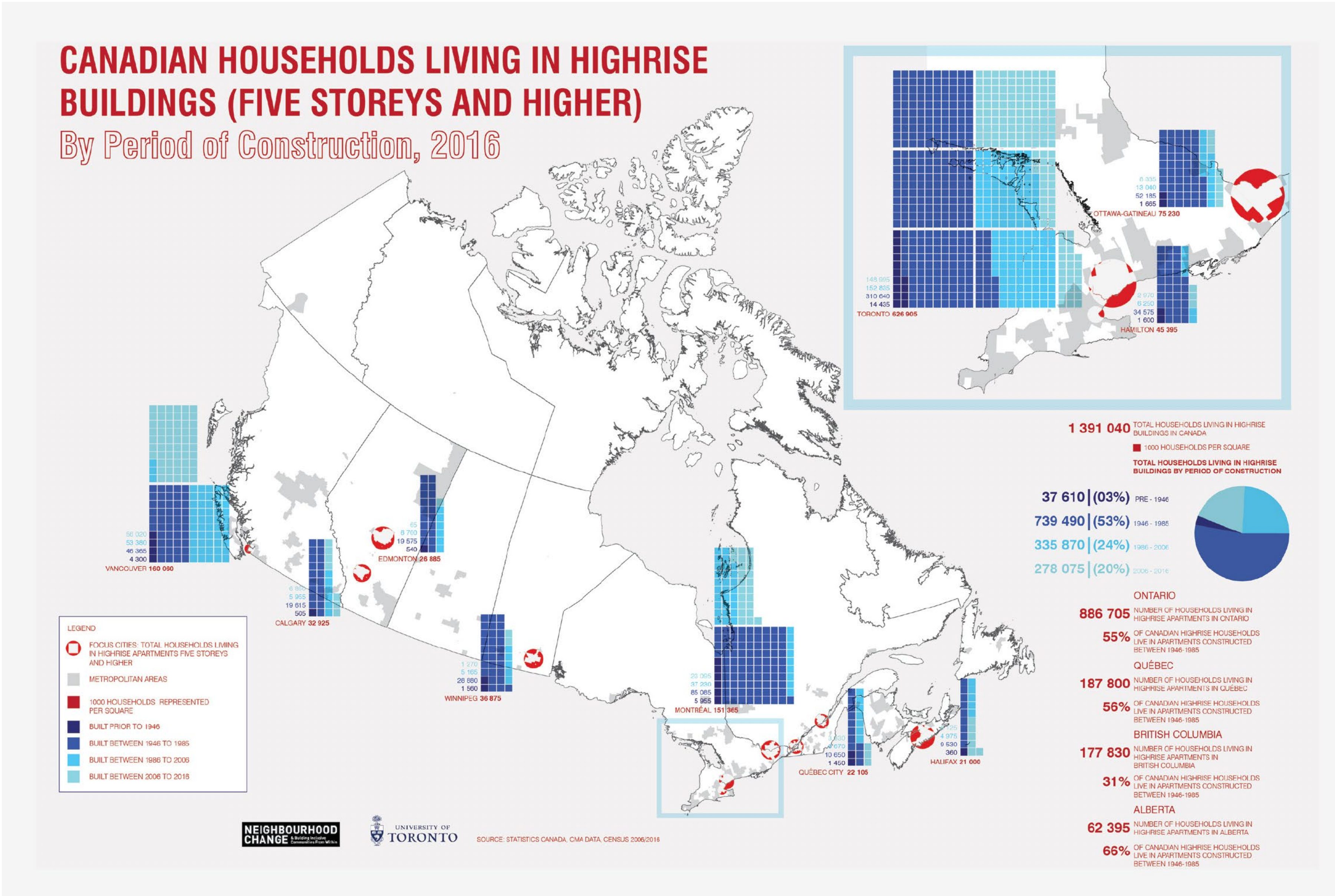
A SCALABLE APPROACH

Canada's affordable apartment towers are the backbone of the rental housing system, representing over half of all high-rise units in the country. With innovative approaches needed to renew this typology, this project challenged local trades to meet its stringent air tightness requirements, install uncommon assemblies and acted as a catalyst for construction training. As more post-war apartment towers fall into disrepair, projects like the Ken Soble tower are a model for resilient, affordable housing ready to meet the challenges of the 21st century.

KEN SOBLE IN 1967 - CITYHOUSING HAMILTON ARCHIVES

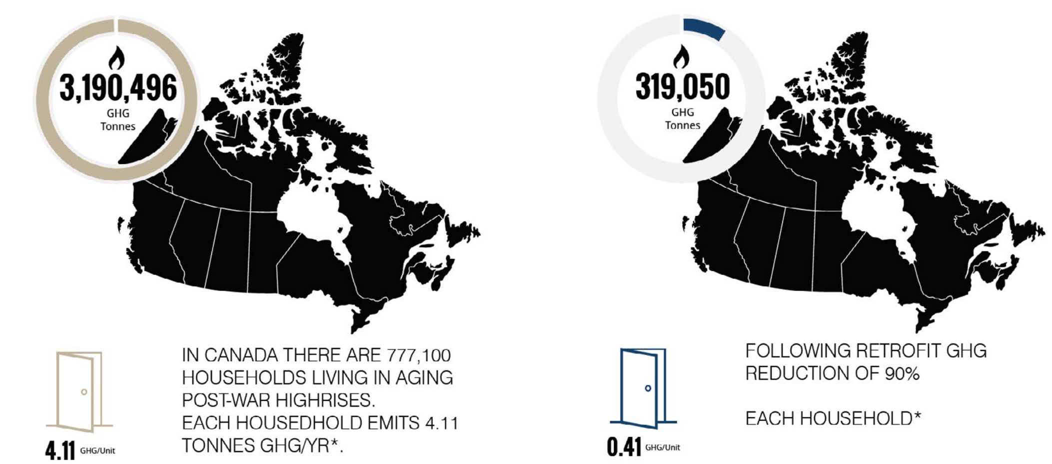


EXTERIOR POST-RETROFIT - DOUBLESPACE PHOTOGRAPHY



THE NATIONAL SCOPE: The Tower Renewal Partnership, ERA Architects' non-profit sister organization, has been instrumental in building the evidence base and toolkit for housing retrofit across Canada. The Ken Soble Tower Passive House Renewal is the marquee project of this broader initiative, testing what is possible, driving innovative design and outlining industry gaps in deep retrofit for advancement to meet Canada's climate change and housing targets.

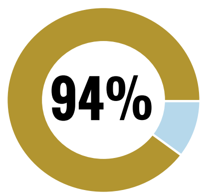
Image courtesy of the archives of Lockwood Survey Corporation Limited



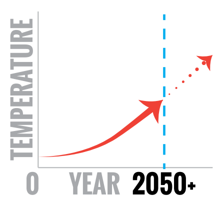
* *The average based on typical building condition per city of Toronto 2016*

Project launch with federal partners

146 units of modernized
AFFORDABLE
SENIORS' HOUSING



reduction of
GREENHOUSE GAS EMISSIONS



DESIGNED FOR A
CHANGING CLIMATE

20% OF UNITS
BARRIER FREE

SYSTEMS

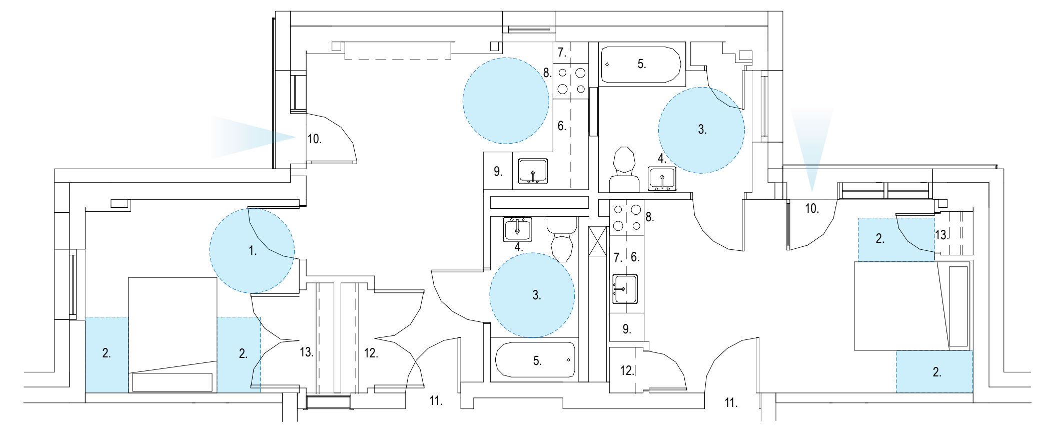
Centralized HVAC with Cooling
Riser Replacements for Most Systems
Full Building Sprinklering

ENVELOPE

R38 Overcladding
Passive House Windows
Juliette Balconies

MODERNIZATION

Accessibility Upgrades
New Community Room and Solarium
Interior Upgrades to Support Aging-in-Place
Rain Gardens and Green Gathering Spaces



TYPICAL BARRIER FREE UNITS - SELECTED ACCESSIBILITY FEATURES*

ACCESSIBLE BEDROOM
1.1500mm diameter turn space
2. A clear floor area of 750x1200mm on two sides of a queen-size bed (CSA 7.4.6)

ACCESSIBLE WASHROOM
3. 1500mm diameter turn space and appropriate clearances at bathtubs, toilets, and sinks (CSA 7.4.3.1)
4. Appropriate clearance underneath bathroom sinks (CSA 7.4.3.1)
5. New barrier-free appropriate fixtures and grab-bars

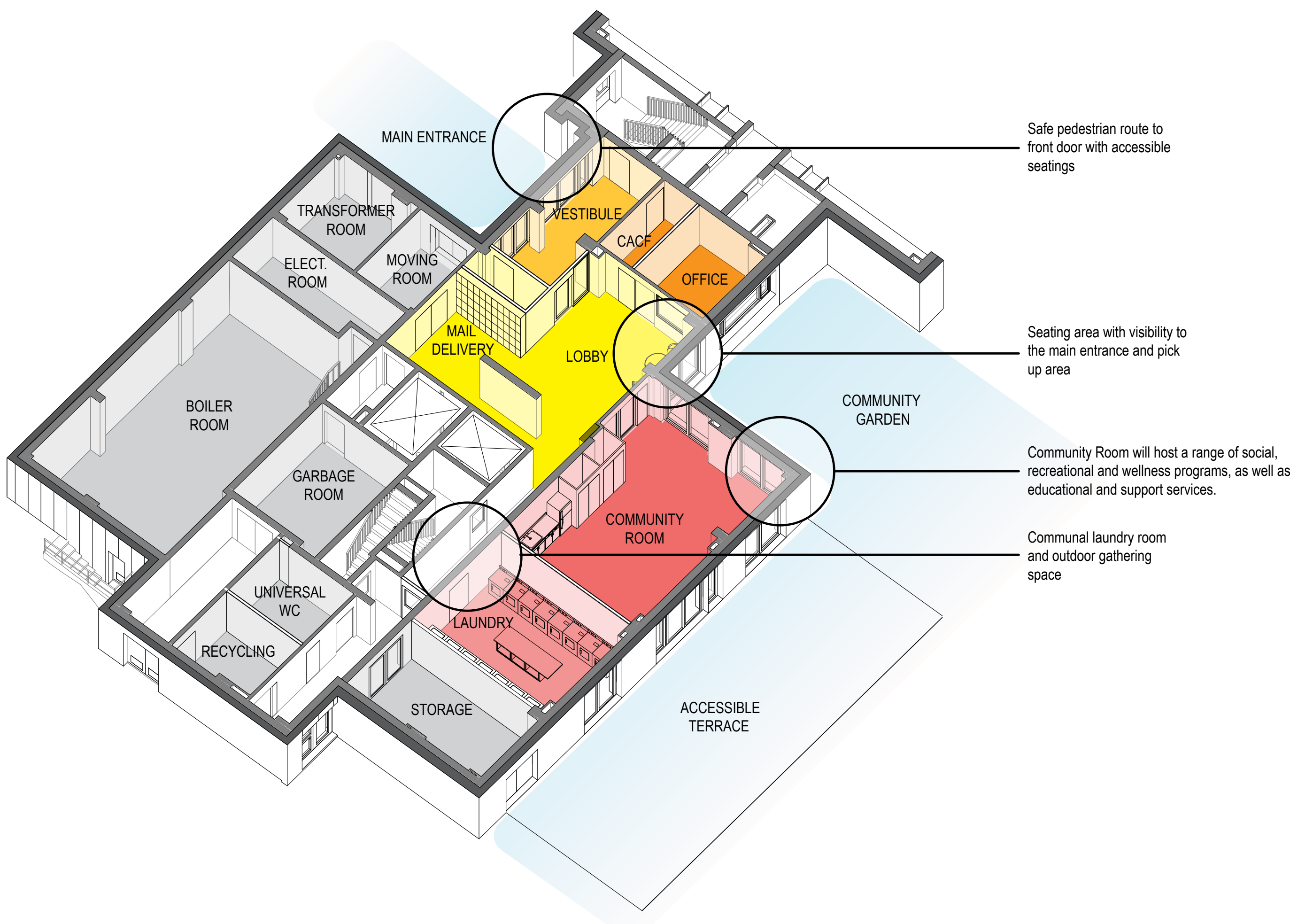
ACCESSIBLE KITCHEN
6. New counter tops at 860mm high, and 600mm deep with appropriate knee clearance underneath. Section of clear counter top 760mm long. (CSA 7.4.4.2)
7. New millwork with at least one shelf at 1100mm high (CSA 7.4.4.9)
8. New kitchen sink and cook top at 860mm high with appropriate clearance under (CSA 7.4.4.4, CSA 7.4.4.6)
9. Refrigerator with freezer shelf-space no more than 1100mm high (CSA 7.4.4.8)

FULL-HEIGHT OPERABLE DOOR to new Juliette Balcony
10. Full door lite allowing exterior views (CSA 7.4.6.2)

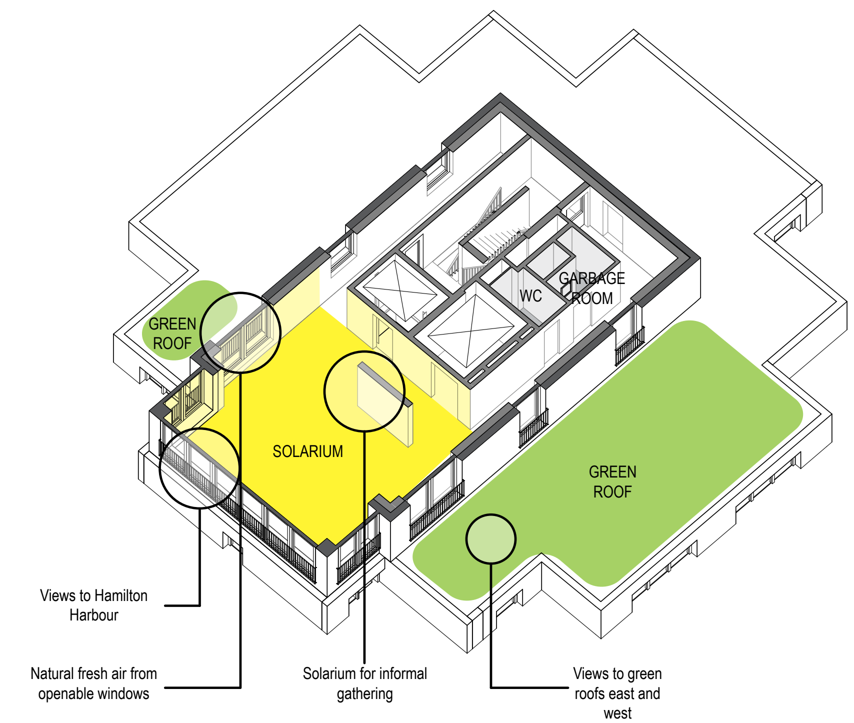
ACCESSIBLE DOORS
11. Minimum 860mm clearance and appropriate push and pull side clearances

ACCESSIBLE CLOSETS
12. Doors that swing outward (CSA 7.4.6.5)
13. Clothes rails between 1200-1400mm and shelves between 300-1200mm (CSA 7.4.6.4)

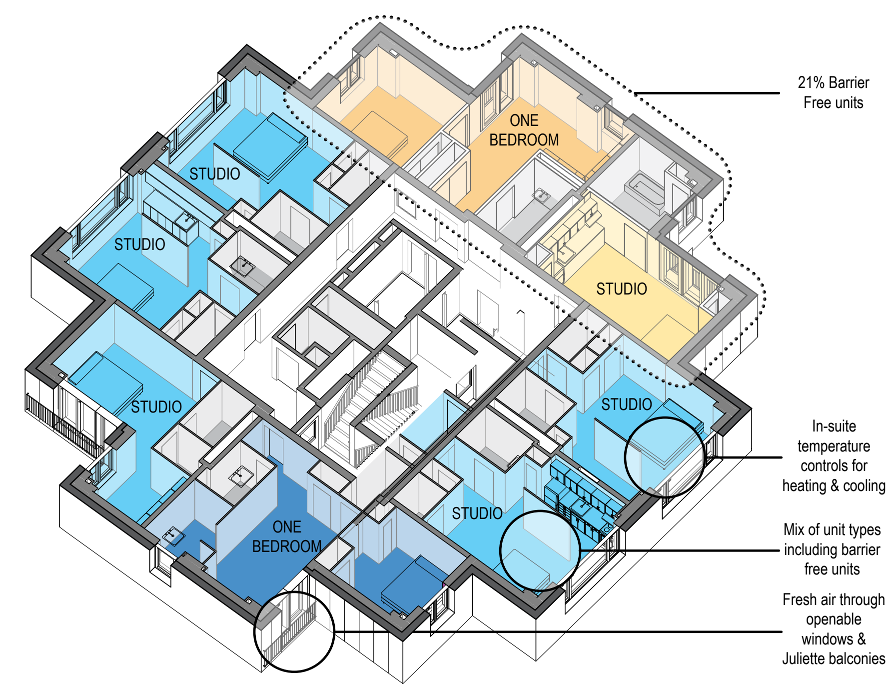
SOCIALLY-DRIVEN DESIGN: Designed for aging in place, the design introduces a new solarium with views over the harbour, barrier free suites, outdoor native planting and rain gardens, and high contrast wayfinding. The project creates new social spaces, opening up the ground floor to community spaces and outdoor gathering areas.



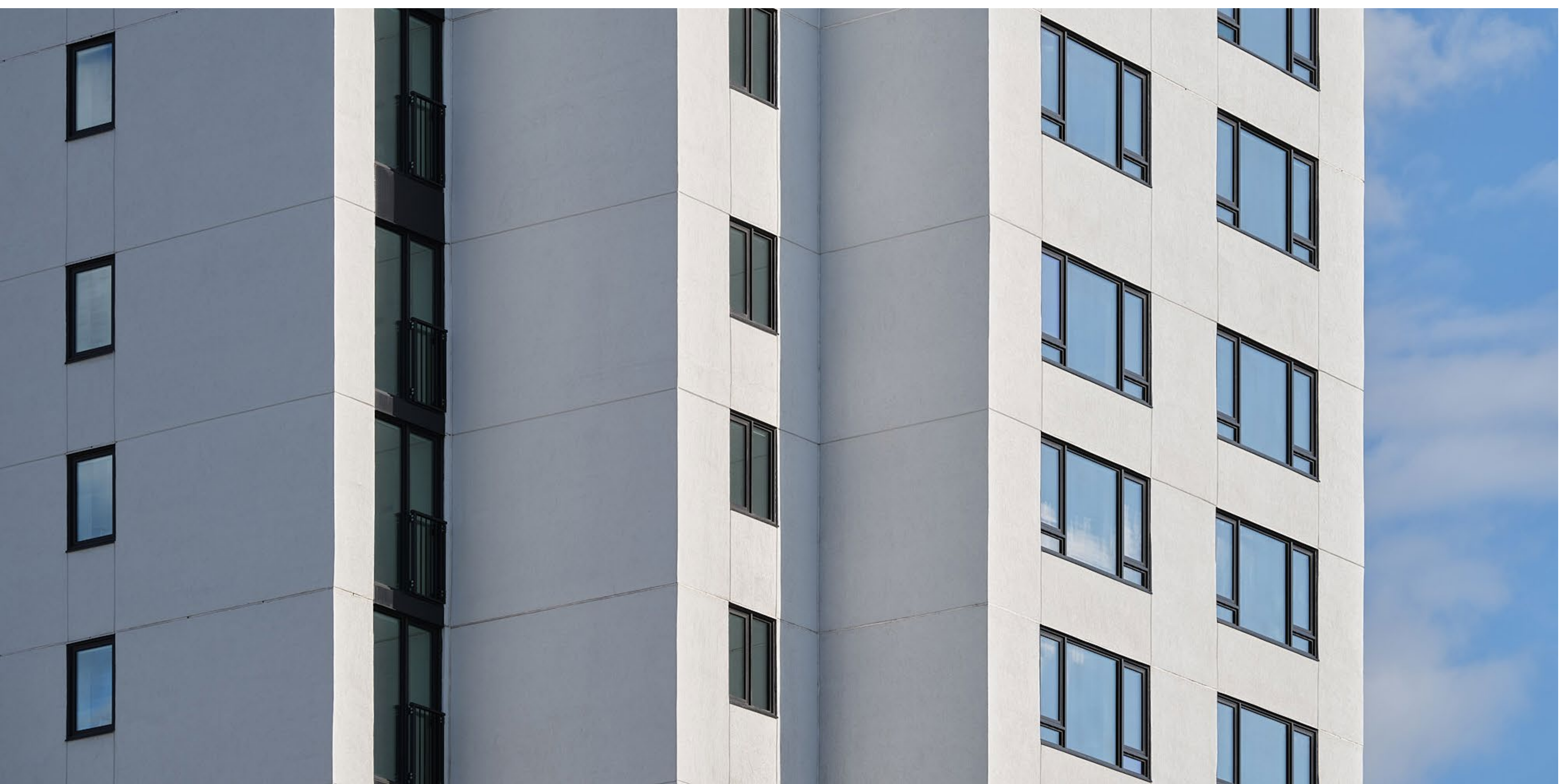
PROPOSED GROUND FLOOR



PROPOSED ROOFTOP SOLARIUM



PROPOSED TYPICAL FLOOR



BUILDING ENVELOPE: A key contributor to overall energy performance, the building envelope renewal had two goals: improve thermal resistance (R-38 effective) to the level required by EnerPHIT, and ensure airtightness to allow for the significant downscaling of mechanical systems.

The design addresses several challenges posed by the existing 1960s structure, including thermal bridges and composite masonry walls with limited interior insulation and vapour control layers. The cladding upgrade also had to minimize intervention to the existing masonry, for thermal and structural reasons. Additionally, to limit combustibility and embodied carbon concerns, a mineral wool-based insulation system was selected. The resulting cladding design includes a 150mm thick mineral wool EIFS system, not widely used in the local market, complete with an integrated drainage layer and new fluid-applied air barrier membrane.

PASSIVE-HOUSE CERTIFIED WINDOWS: Passive House-certified windows suitable for high-rise buildings are not widely available in the North American market. An Alternative Solution was submitted to the local building authority to permit the use of fibreglass-framed windows, typically prohibited in non-combustible, high-rise applications. The successful submission, which references the upcoming changes to the National Building Code, will allow their use in this application for one of the first times in Ontario.

FACADE IMPROVEMENTS UNDER CONSTRUCTION

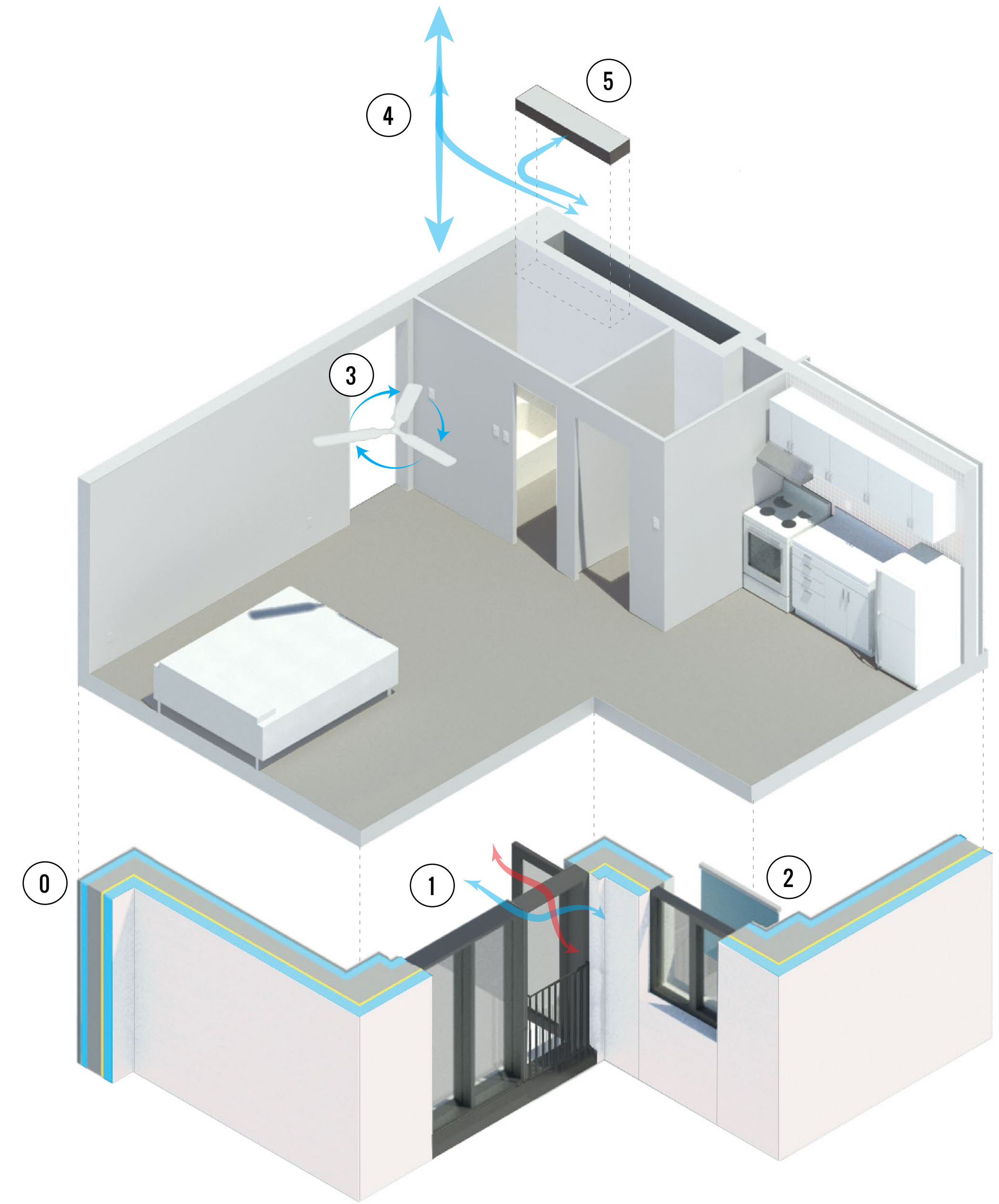


BRIGHT, CLEAN SUITES PROVIDE HIGH-QUALITY, HEALTHY AND SECURE HOUSING (DOUBLESPACE PHOTOGRAPHY)

FIVE STAGE COOLING STRATEGY: Passive House high-rise buildings can be prone to overheating, particularly in humid climate zones, and particularly in shoulder seasons.The design team was tasked with mitigating overheating risk, which can be a cause of death in vulnerable populations. To avoid overheating in the units without installing external operable shading a five-stage cooling strategy was designed. It included:

- Glazing with a low Solar Heat Gain Coefficient (SHGC);
- Low emissivity interior shades;
- Ceiling fans to circulate air within units;
- Lightly tempered air delivered through a centralized ventilation system
- Decentralized cooling ‘boost’ through a Variable Air Volume Unit activated by in-suite controls.

Detailed dynamic simulations for both present day and future 2050 Toronto climate zones were used to inform the design, securing resilience to temperatures which are projected to rise significantly over the next 30 years.

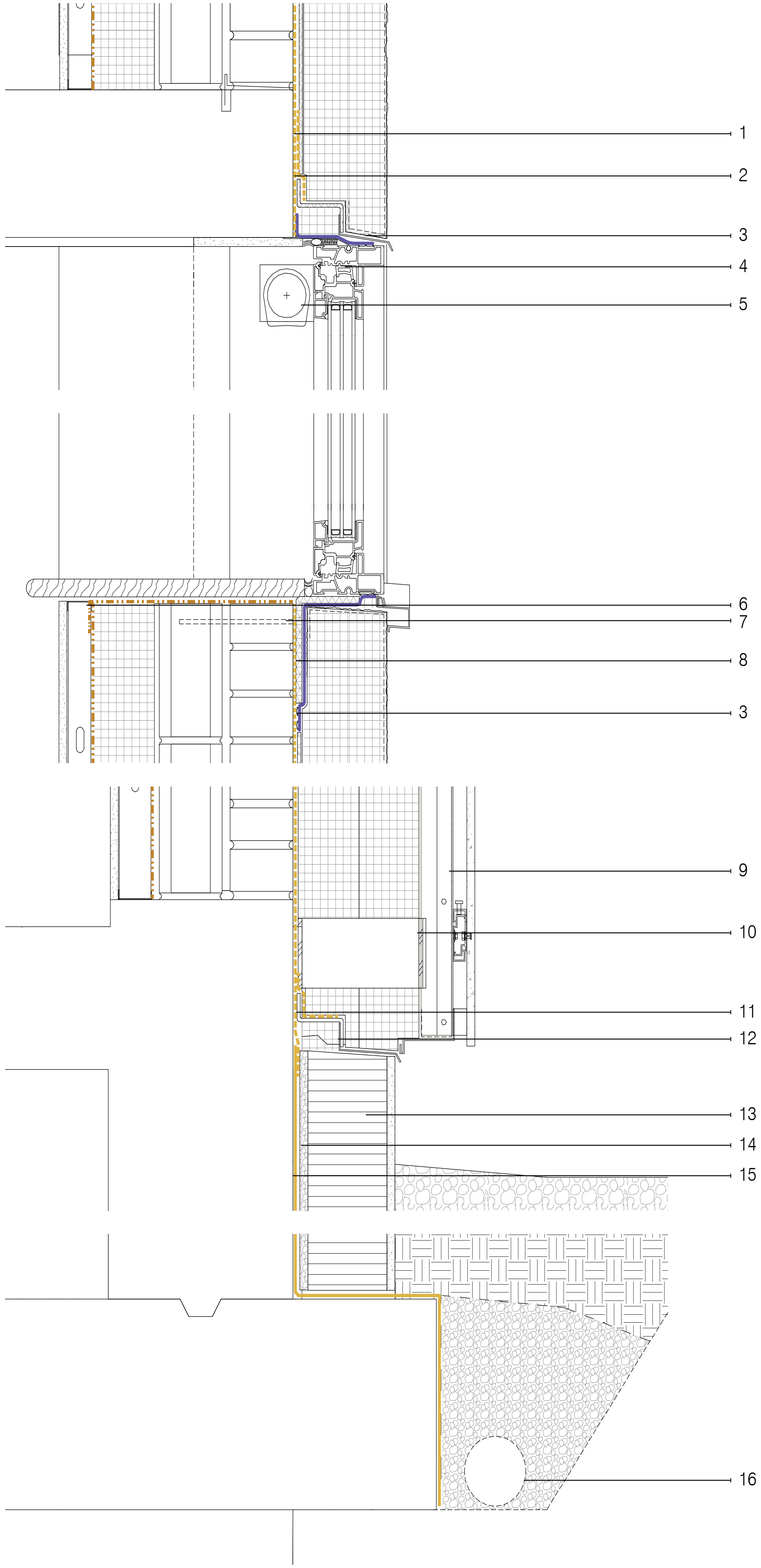


DYNAMIC THERMAL COMFORT THROUGH COOLING

0 1 2 3 4 5

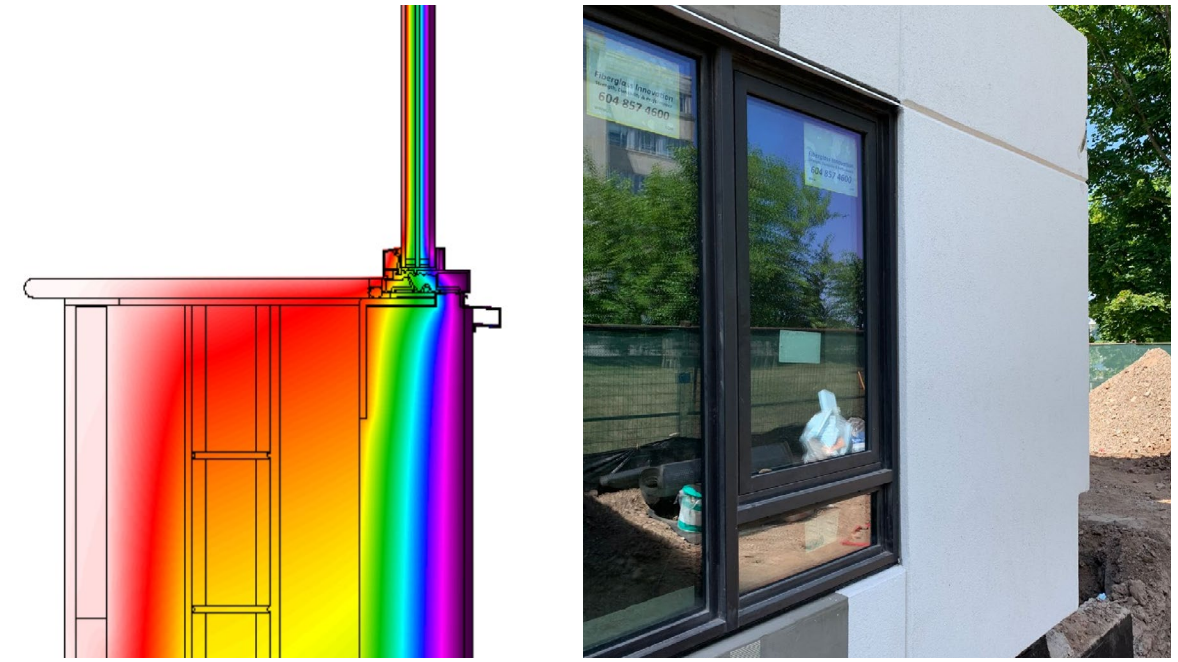
Passive → *Active*

0. R38 Effective Envelope
1. Glazing with a low Solar Heat Gain Coefficient
2. Low emissivity interior shades
3. Ceiling fans to circulate air within units
4. Lightly tempered air delivered through a centralized ventilation system
5. Decentralized cooling ‘boost’ through a Variable Air Volume Unit activated by in-suite controls



1. AWB Flashing
2. Polyurethane Z-Girt
3. Silicone Transition Strip
4. Fiberglass Window
5. Roller Shade
6. Vapour Barrier
7. Helical Tie
8. Fiberglass Angle
9. Galvanized Steel Girt
10. Fibreglass Cladding Clips
11. AWB Flashing
12. Polyurethane Thermal Break Z-Girt
13. Concrete-Board Faced XPS Insulation
14. Drainage Plane
15. Fluid Applied Bituminous Waterproofing
16. Weeping Tile

TYPICAL WALL SECTION ACHIEVING R-38 EFFECTIVE AND 0.6 ACH @ 50PA



PASSIVE HOUSE THERMAL MODELLING AT WINDOW SECTION

PASSIVE HOUSE DESIGN CHALLENGES: Achieving the EnerPHit certification required the combined knowledge and collaboration of the entire design team. This meant finding new building envelope and mechanical solutions, and designing unique specifications around installation quality and air tightness. Time was spent ensuring that products were readily available in Ontario that would meet the stringent targets.

A number of technologies that are standard and affordable in Europe are not yet widely available in the Canadian market, requiring alternative approaches to achieving the targets. These included: integrated facade shade systems, high efficiency elevators and appliances, standard thick external insulation systems, high performance Passive House certified high-rise windows, decentralized ventilation units, and decentralized hydronic heating and cooling units. As a result, a more North American approach was taken in the centralized ventilation, heating, cooling and hot water systems, and by incorporating heat losses from North American building components, such as code-required back-up generator block heaters, garbage chutes, and standard elevator machines .

Designed in Europe, the Passive House standard can at times be at odds with Ontario's humid climate and local building code. Most of Europe does not experience the humidity of the east coast of North America - peak wet-bulb temperatures are typically under 24°C in Europe, but 30°C or higher in Ontario - and therefore the standard does not necessarily take into account the negative health and comfort impacts of humidity. While the Passive House standard relies on ventilation without additional cooling systems, the design team identified a high risk of overheating due to high relative humidity in the regional climate zone. As such, a centralized air conditioning system was integrated into the design, with resulting impacts on the Passive House energy budget.

INTERIOR OF RENOVATED SUITES - DOUBLESPACE PHOTOGRAPHY

COMMUNITY TERRACE

MEASURING IMPACT TO SCALE CHANGE

KEN SOBLE TOWER TRANSFORMATION

HEALTH IMPACTS ER visits / Attendance at Public Health Services / Heat-Related Thermal Stress / Missed Work

SAFETY FACTORS Home Fire Incidents / Accessibility within Common Areas / Police Calls / Break-Ins

HOUSING QUALITY IMPACTS Outdoor Noise Disruptions / Indoor Air Quality / Elevator Breakdowns

AFFORDABILITY IMPACTS Tenant Turnover / Ability to Pay Utility Bills / Ability to Pay Rent / High-Cost Loans

OPERATIONS Pest Control Incidents / Tenant Complaints / Equipment Maintenance / Repairs and Replacements

ENVIRONMENTAL FACTORS Avoided GHG Emissions / Utility Costs / Avoided Material in Waste Stream

ECONOMIC FACTORS Trades Training / Property Value / Operating Costs / Vacancy Rate / Reserve Fund

The project includes a longitudinal post occupancy analysis run by the University of Toronto and supported by CMHC, examining environmental, social and economic factors outlined above through quantitative and qualitative analysis.