MEADOWBROOK LANE PASSIVE HOUSE RESIDENCE

Passive House delivers affordable living

1.The building has a super airtight high R-Value building envelope, triple-glazed windows, thermal bridging mitigation and energy recovery ventilation to achieve Passive House Certification.

By Peter Ng and Irene Rivera

Meadowbrook Lane is the first multi-unit residential high-rise building to be built by Windsor Essex Community Housing Corporation (WECHC) in 30 years. The 10-storey multi-unit residential building brings much needed affordable housing to the City of Windsor.

The building includes 145 affordable housing units, from bachelor to three-bedroom suites, with shared amenity space on each residential floor. The ground floor of the building has offices, a multipurpose room, laundry room and a four-bedroom community special care unit.

The WECHC wanted the building to be energy efficient and designed to meet Passive House standards for certification by the Passivhaus Institute (PHI) in Germany. In adhering to the principles of Passive House Design, rigorous effort was exercised to uphold a robust continuous airtight thermal envelope, prioritizing the continuity of the air barrier membrane by managing service penetrations.

The design was guided by the Passive House Planning Package (PHPP) model, with all consultants involved in designing the systems to meet Passive House Classic Certification. Beyond the design phase and during construction, the installation of the air membrane was monitored and documented regularly to ensure its integrity and continuity were not compromised and would meet the 0.6ACH or below air change per hour at 50Pa as required by PHI. The building achieved an impressive final result of 0.123ACH.

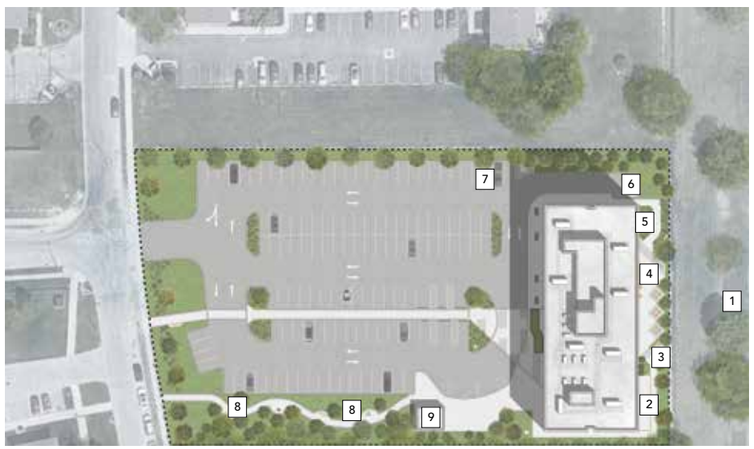
2. The darker east elevation captures heat gain from the morning sun during the winter while the lighter west elevation (photo 1) reduces heat gain from the summer sun. The building is sited away from the main street and closer to the golf course to take advantage of the surrounding vegetation and a tranquil setting.
3. A vegetated roof to be installed on the front entrance canopy will announce the green features which the project embraces.

Ground floor

Floor plans
1. Vestibule / entry
2. Amenity
3. Laundry
4. Commercial space 4 bed congregate
5. Garbage room
6. Elevator shaft
7. Mechanical
8. Exit to outdoor office amenity space
9. CACF
10. Exit stairs
11. Amenity
12. Mail room

Typical residential floor

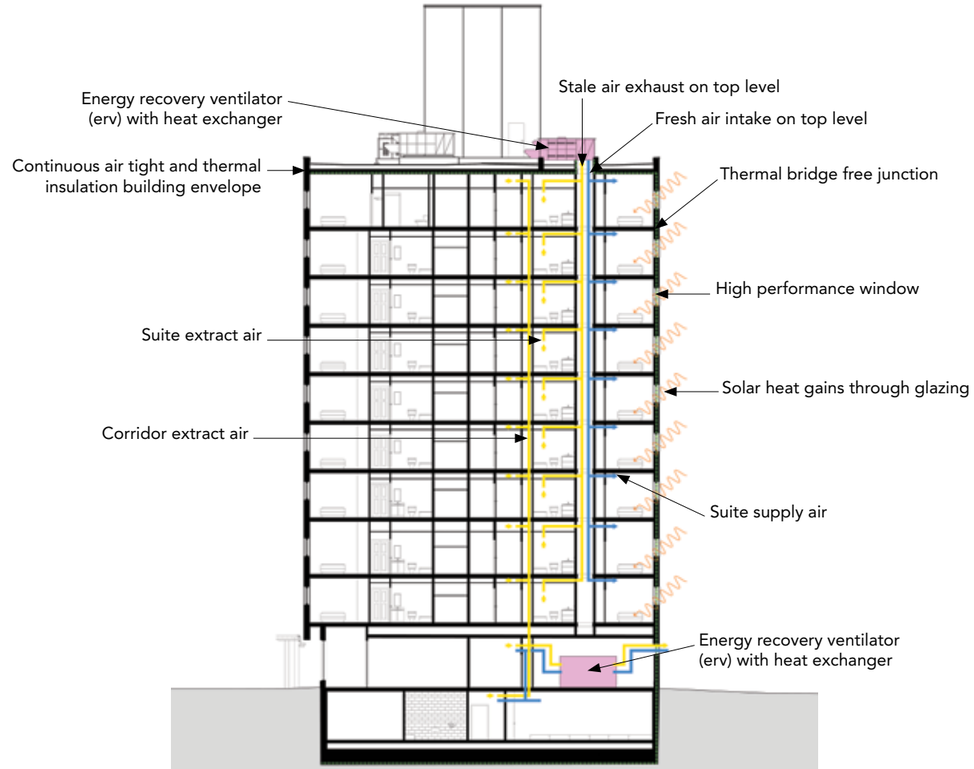
Within the building, 'vertical' community neighbourhoods are facilitated by one amenity room on every residential floor with a view to the nearby golf course. The multi-purpose ground floor amenity room provides a venue for both residents and external functions and opens to a community garden furnished with a barbeque, seating areas, a bike shelter with charging stations for 10 e-bikes, and four EV parking stalls with chargers in the parking area.



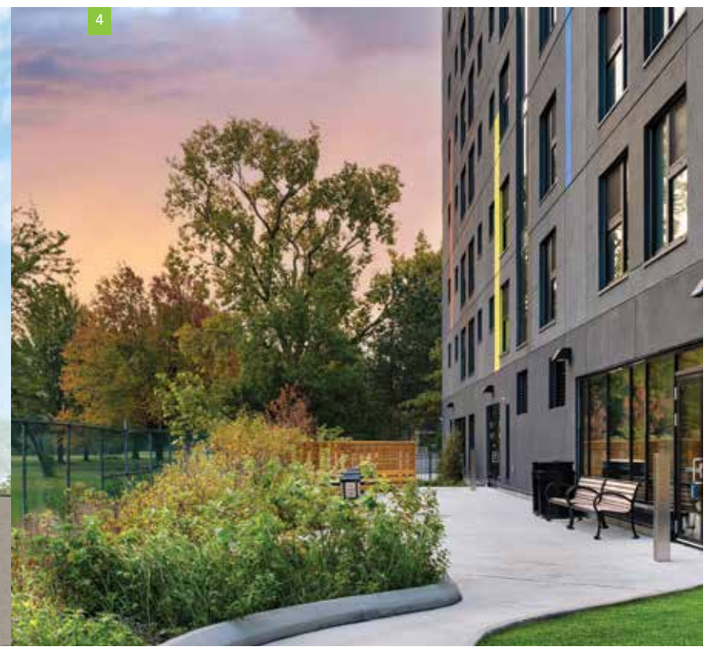
Site plan N

1. Golf course
2. Vegetable garden
3. Community garden
4. Special care unit patio
5. Refuse pick up
6. Four ev parking spaces
7. Fitness stations
8. Bike shelter
9. Restorative garden

South elevation



Ventilation Diagram/Section

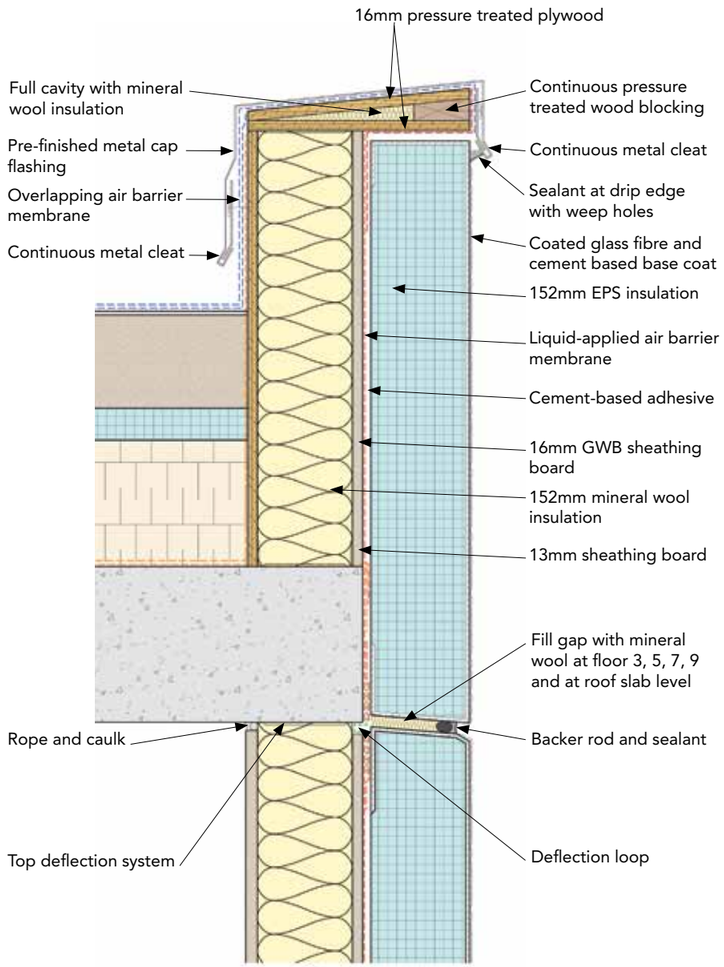


4. The landscaping integrates the building to the site using native and drought-tolerant species in keeping with the natural flora of the area.

The building has two primary elevations: the west, facing the street, and the east, facing the golf course. The west and east elevations were, by intention, finished in two different colours to make the north and south ends of the building appear more slender and less intrusive to the neighbouring buildings.

The dynamic composition of colour patterns in the elevations, which incorporate groupings of the large windows, attempts to remove the stigmatization that affordable housing is lifeless, dull and lacks visual interest. Colours are also used extensively inside the building as a wayfinding tool giving each amenity area and elevator lobbies an identity.

The basement mechanical service room houses two water cisterns ready to receive a rough-in connection for rainwater collection in the future. The domestic hot water consumption is estimated to be 25litres/person/day.



Section at roof parapet

The landscaping integrates the building to the site using native and drought-tolerant species in keeping with the natural flora of the area. A vegetated roof on the front entrance canopy announces the green features the project embraces.

Given that the site is in a predominantly single-family and low-rise neighbourhood, the building was receded away from the street to diminish its scale and to benefit from the tranquil setting of the golf course while maintaining its frontality with an east-west orientation.

ENVELOPE AND HVAC

The exterior wall envelope is a drainable EIFS system backed by an insulated steel stud sheathing board assembly. With a continuous insulation and airtight layer, the wall minimizes thermal bridging and achieves a U-value of 0.156 W/(m^2K). The low U-value triple-glazed high-performance windows further enhance energy efficiency.

The roof assembly is a poured concrete slab with two layers of high density polyisocyanurate sloped insulation, protected by 51mm (2″) of semi-rigid mineral wool board insulation. It has a U-value of 0.109 W/(m^2K). The roof assembly tops off with a 2-ply roof membrane system.

5

6

XPS insulation of 203mm (8″) thickness is placed around the entire underground perimeter of the building foundation walls which have a U-value of 0.188 W/(m^2K).

Operable windows are a standard feature in the residential units, ensuring that 100% of the area is within 7 metres of a window for natural ventilation. Lighting in common areas is efficiently managed by occupancy sensors.

Mechanical ventilation is primarily distributed downward through vertical shafts, reducing horizontal duct runs and allowing for the utilization of common ceiling spaces for other services. The ERV system continuously filters and refreshes the air. Carbon dioxide (CO_2) sensors are strategically placed in common areas to direct the mechanical system to adjust ventilation rates automatically according to CO_2 levels.

PROJECT PERFORMANCE

ENERGY INTENSITY, BASE BUILDING = 10.69KWh/m2/year

ENERGY INTENSITY, PROCESS ENERGY = 135.70KWh/m2/year

REDUCTION IN ENERGY INTENSITY RELATIVE TO REFERENCE BUILDING UNDER ASHRAE 90.1, SB-10 AND OBC 2017

ASHRAE 90.1-2010 = 87%

PROJECT CREDITS

OWNER/DEVELOPER Windsor Essex Community Housing Corporation (CHC)

ARCHITECT Kearns Mancini Architects

GENERAL CONTRACTOR Amico

LANDSCAPE ARCHITECT Fleisher Ridout Partnership

CIVIL ENGINEER Morrison Hershfield

ELECTRICAL/MECHANICAL ENGINEER: Integral Group - Introba

STRUCTURAL ENGINEER RJC Engineers

COMMISSIONING AGENT JLSR Engineering Inc

PASSIVE HOUSE CERTIFICATION Peel Passive House

PHOTOS Craft Architecture Photography & Video

5. The project is designed to achieve Fitwel certification standards to promote occupant health and wellness. Colours are used inside the building as a wayfinding tool giving each amenity area and elevator lobby an identity.
6. Larger windows with view to the golf course.

The repetitive arrangement of mirrored and stacked residential suite types results in efficiencies in domestic hot water pipe runs and ventilation system distributions. The integration of passive house design into the mechanical, electrical control systems is essential to reducing energy consumption and GHG emissions while enhancing occupant comfort and well-being.

This holistic approach to building design and operation was critical to deliver a successful high performance passive house building with comfort and health benefits.

PETER NG IS A SENIOR PRINCIPAL AND IRENE RIVERA IS AN ASSOCIATE ARCHITECT AND CERTIFIED PASSIVE HOUSE DESIGNER WITH KEARNS MANCINI ARCHITECTS.