EN025-01247 SIXTH LINE

ENERGY MODELING REPORT

ENERGY MODELING ANALYSIS - SCHEMATIC DESIGN
ISSUED FOR CMHC ACLP
DATE: 15TH AUGUST 2025

REPORT SUBMITTED TO PENALTA GROUP

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1. GENERAL PROJECT INFORMATION

The project is a 6-storey affordable housing building located in Oakville, Ontario. The building has an approximate Gross Floor Area (GFA) of 10,819 m^2 (excluding the underground parking area). The building consists of apartment condos, daycare, and underground parking. The following key information and context is the basis on which we have built the energy model.

Table 1. General project information

Project	Kindred Works – Wexford
Building Description	The facility is a multi-family residential building.
Building Address	Oakville
Building Permit No.	TBD
Climate Zone	Heating Degree Days HDD (below 18°C) 3,451, Ref: NECB 2017 Zone 5
Weather Data	CAN_ON_Toronto.City.715080_CWEC2020.epw
Floor Area	Modelled Floor Area: 10,819 m^2 (without parking) Parkade: 1,975 m^2
Emissions factor	Electricity – 0.063 $kgCO_2e/kWh$ (Source: CaGBC ZCB designv4)
Suites	185 Suites
Project Phase	Schematic Design
Standards	National Energy Code of Canada for Buildings (NECB) 2020
Drawing Sets	SD architectural drawings
Software	IES-VE 2024-0-0-0
Energy Model Simulator	Shima Dadvar P.Eng, CMVP
Energy Modelling Contact Information	Biren Singh (biren.singh@entuitive.com) Shima Dadvar (shima.dadvar@entuitive.com)

2. ENERGY PERFORMANCE SUMMARY

The project is to comply with the requirements of CMHC's Apartment Construction and Loan Program (ACLP) and is targeting Tier 3 level of energy performance. Entuitive has been engaged to provide energy modeling services to support this target.
The energy performance levels required by CMHC funding follow a tiered structure based on energy savings over the National Energy Code of Canada for Buildings (NECB) 2020. The performance tiers are outlined below in Table 7:

Table 2 Performance tiers for CMHC Funding Program ACLP

2020 NECB Performance Tiers	Score
Tier 1 – Baseline Code	0 pts
Tier 2 – 25% Improvement over Tier 1	10 pts
Tier 3 – 50% Improvement over Tier 1	20 pts
Tier 4 – 60% Improvement over Tier 1	35 pts

The project will target tier 2 level of savings over NECB 2020 for CMHC ACLP funding and will need to comply with Ontario building code SB-10. CMHC funding provides grants and loans to support projects for affordable housing providers to pursue ambitious reductions in energy consumption through highly energy-efficient newbuilds.

The Proposed design energy model was developed using design drawings and documents made available to us as noted in Table 1.

Table 3 Summary of performance of as designed Proposed Model to NECB 2020 for CMHC funding.

	Proposed Building	NECB 2020 Reference Design	Savings %
Energy Use Intensity (kWh/m^2)	**123.1**	**227.6**	**45.9%**
TEDI (kWh/m^2)	**51.3**	**77.0**	**33.3%**
GHGI (kg CO_2e/m^{2}yr)	**7.8**	**33.8**	**77.1%**

The current proposed design is 45.9% better in energy consumption and 77.1% better in terms of GHG emissions than an NECB 2020 reference model as required by CMHC. Please note, the NECB comparison in this report compares a heat pump to a natural gas boiler as allowed by CMHC.

An energy conservation measure analysis has been conducted to show what the building would need to do to achieve tier 3 levels of performance for CMHC funding.

3. KEY INPUT DATA

The following building characteristics are the basis of the proposed design energy model.

ENVELOPE:
All values include thermal bridging and are overall-effective.

- Infiltration 0.25 l/s/m^2 at 5Pa
- Roofing R-40
- Exterior Walls R-7
- Below Grade Walls R-7
- Slab over Parkade R-20
- Fully Insulated Slab on grade F Factor-0.88
- Windows U_{SI}: 1.7, SHGC 0.40

HVAC:

- HVAC plant
  - Unitary air source heat pumps with integrated ERVs (COP: 3.2 in heating, 3.4 in cooling)
  - Energy recovery ventilation (sensible 70%/ latent 60%)
  - Corridor pressurization of 15 cfm per door
  - 100 cfm per kitchen hood exhausted and not included in ERV
- DHW
  - Electric Domestic hot water

OTHER:

- Remaining Setpoints and schedules based on NECB 2020
- Electrical loads based on NECB

4. ENERGY MODELLING RESULTS

The energy performance of the entire facility is summarized in Table 4, this compares the proposed model to NECB 2020 Baseline model as prescribed by CMHC.

Table 4 Summary of Proposed and NECB 2020 results for CMHC funding

	Proposed Model		CMHC Reference			
	Electrical (MWh)	EUI (kWh/m²)	Electrical (MWh)	Natural Gas (MWh)	EUI (kWh/m²)	Savings by end use (%)
Heating	252.2	23.3	0.0	1109.8	102.6	77%
Cooling	62.7	5.8	131.8		12.2	52%
DHW	484.2	44.8		538.0	49.7	10%
Fans	151.7	14.0	291.0		26.9	48%
Pumps	0.0	0.0	10.5		1.0	100%
Elevator	23.2	2.1	23.2		2.1	0%
Receptacle Loads	166.6	15.4	166.6		15.4	0%
Interior Lighting	191.1	17.7	191.1		17.7	0%
Total	**1,331.7**	**123.1**	**814.2**	**1,647.8**	**227.6**	**45.9%**
GHGI (kg CO2e/m2yr)	**7.8**		**33.8**			**77.1%**
TEDI (kWh/m2)	**51.3**		**77.0**			**33.3%**

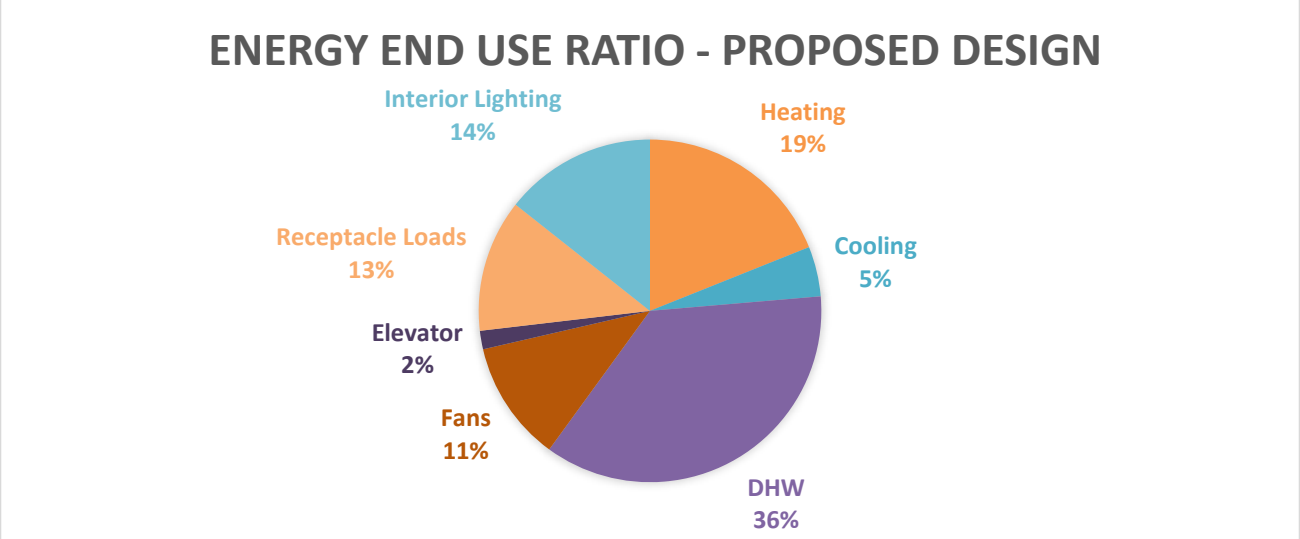

Figure 1 Energy Use Ratio of the Proposed Design

The comparison of end use savings against the NECB model can be seen in Figure 2 below.

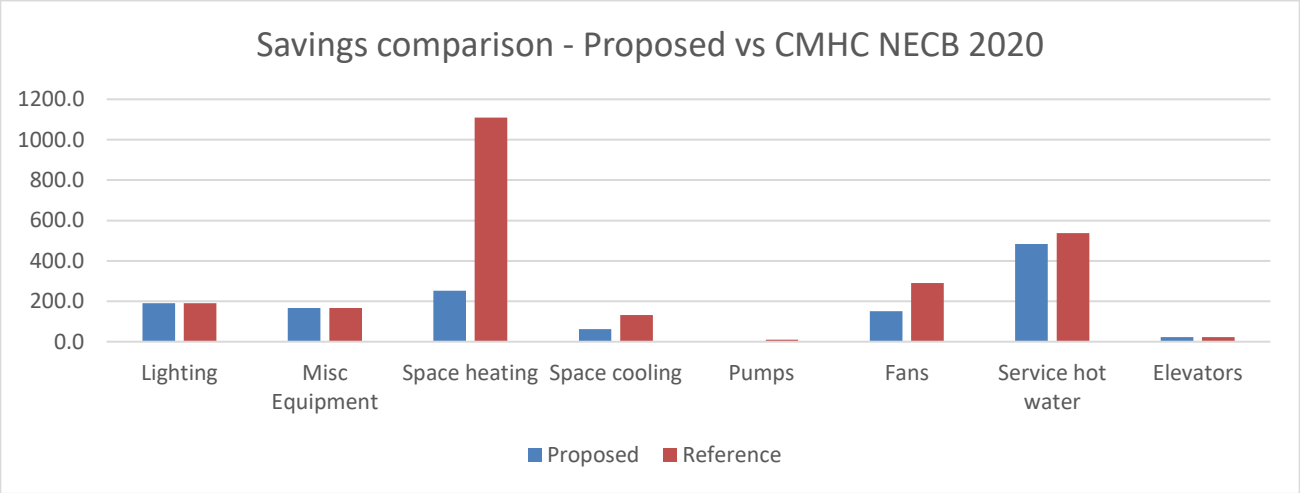

Figure 2 Savings comparison between proposed model and NECB 2020 for CMHC funding

5. ENERGY CONSERVATION MEASURE (ECM) ANALYSIS

The current design meets the requirements to achieve Tier 2 level of CMHC ACLP funding. An Energy Conservation Measure (ECM) analysis was conducted to explore ways to reduce the building's energy consumption and meet the requirements of CMHC Tier 3, which requires a 50% energy savings over the NECB baseline. Table 5 outlines the results of the ECM analysis.

ECM1– Domestic water heating supplied using air source heat pumps (COP2.5).

ECM2– Low flow fixtures (20% reduction compared to NECB 2020) and improve in suite and common areas energy recovery ventilation efficiencies to sensible 83%.

ECM3 – Low flow fixtures (20% reduction compared to NECB 2020) and improve the glazing to USI-1.5.

Table 5 Results of the ECM analysis

	EUI (kWh/m²)	TEDI (kWh/m²)	GHGI (kg CO_2e/m^2yr)	Energy Saving	TEDI Saving	GHGI Saving	CMHC Compliance Tier
NECB 2020	227.6	77.0	33.8	-	-	-	
Proposed Design	123.1	51.3	7.8	45.9%	33.3%	77.1%	Tier 2
ECM 1- ASHP DHW	96.2	51.3	6.1	57.7%	33.3%	82.1%	Tier 3
ECM 2- Low Flow Fixture	114.5	51.3	7.2	49.7%	33.3%	78.8%	Tier 2
ECM 3- Low Flow Fixture and ERV 83%	111.4	43.3	7.0	51.1%	43.7%	79.3%	Tier 3
ECM 4-Low Flow Fixture and Glazing USI-1.5	113.9	49.7	7.2	50.0%	35.4%	78.8%	Tier 3
ECM 5- Low Flow Fixture and R-9 (Effective) Walls	111.9	45.4	7.0	50.8%	41.0%	79.2%	Tier 3

6. CONCLUSION

The current design for the sixth line project demonstrates superior energy efficiency through passive and active design strategies. The project's energy use is 45.9% better in terms of energy and 77.1% better in terms of GHG emissions when compared to an NECB 2020 model as prescribed by CMHC.

The project this complies with the requirements of Tier 2 (25% savings) and can achieve Tier 3 (50% savings) funding requirements if select energy conservation measures are implemented.

7. ERRORS

Underheated and Undercooled hours: Within limits as allowed by code

Simulation Errors: No errors reported by the energy modelling software.

8. LIMITATIONS

This report has been prepared for the exclusive use of the Sixth Line project for the purpose of demonstrating compliance with the TGS and for CMHC funding. Entuitive requests the opportunity to review the analysis and conclusions contained in this report if new information becomes available.

The Proposed Design building performance, has analyzed via the energy simulation model, are not an accurate prediction of actual energy consumption and associated energy cost under operation and should be used for comparison only. Actual performance will differ from the results summarized in this report due to unpredictable variations in weather, occupancy, operations, utility rates and equipment not included in this analysis. Any use that a third party makes of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties.

The results presented in this report are subject to change if new information regarding envelope, mechanical or electrical input data is made available.

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Appendix A – ENERGY MODEL INPUT DATA

MODELLING INPUT SUMMARY

Load Estimate: are based on NECB 2020.

Table 6 Summary of Proposed and NECB Reference Modelling Inputs

General Model Information			
Model Input Parameter	**Units**	**Proposed Design**	**NECB 2020 Reference for CMHC**
Project Name	-	Sixth Line – Oakville, ON	
Project Number	-	EN025-01247	
Simulation Software		IESVE 2024.0	
Weather File	-	CAN_ON_Toronto.City.715080_CWEC2020.epw	
Project Location	-	Sixth Line – Oakville, ON	
Building Type	-	Residential, daycare	
Heating Degree Days	-	3760	
Climate Zone		5	
Modelled Floor Area	m^2	Modelled Floor Area: 10,819 m2 (without parking) Parkade: 1,975 m2	
Building Schedules	-	Residential: NECB G Daycare: NECB D	
Rating Authority			
Energy Modelling Phase		Schematic Design	
Energy Modeler Contact		shima.dadvar@entuitive.com	
Peer Reviewer Contact		biren.singh@entuitive.com	
Occupancy	-	NECB	
GHG Emission	gCO_{2e}/kWh	Electricity – 0.63 kg/kWh (Source: CaGBC Zero Carbon building standard v4) Natural gas – 0.191 kg/kWh (Source: CaGBC Zero Carbon building standard v4)	
Winter Indoor Temp	°C	22 (occupied) / 18 (unoccupied)	
Summer Indoor Temp	°C	24 (Occupied) / OFF (Unoccupied)	
Building Envelope Parameters and Areas			
Model Input Parameter	**Units**	**Proposed Design**	**NECB 2020 - Code Compliance**
Window to Wall Ratio	%	19.0%	40% (NECB 2020 - 3.2.1.4-1)
Skylight Ratio	%	0	2 (NECB 2020 - 3.2.1.4-2)
Air Leakage	$L/(s \bullet m^2)$	0.25 @5 pascal (NECB 2020 - 8.4.3.3 -3)	
External Wall 1	Construction	To be confirmed	0.265 (NECB 2020 - Table 3.2.2.2)
	Effective $W/(m^2 \bullet K)$	Rip=7 (USI-0.811)	

Basement Wall	Construction	To be confirmed	
	Effective W/(m²•K)	Rip=7 (USI-0.811)	
Roof 1	Construction	To be confirmed	0.156 (NECB 2020 - Table 3.2.2.2)
	Effective W/(m²•K)	Rip=40 (USI- 0.141)	
Parkade Roof	Construction	To be confirmed	0.175 (NECB 2020 - Table 3.2.2.2)
	Overall Effective W/(m²•K)	Rip=20 (USI-0.284)	
Slab on Grade	W/(m²•K)	F Factor =0.88	Concrete slab with 1.2m of perimeter insulation @ U-0.757 (R7.5) - NECB 2020 Table 3.2.3.1 F Factor = 1.13
Window 1	Construction	Double glazed window (assumed)	1.9 (NECB 2020 - Table 3.2.2.3)
	Effective W/(m²•K)	1.7, SHGC=0.4	
Door	Construction		1.9 (NECB 2020 - Table 3.2.2.3)
	Effective W/(m²•K)	1.9	

Internal Gains Parameters and Areas

Model Input Parameter	Units	Space	Proposed LPD	Schedule	NECB 2020 - LPD
Space-by-Space Lighting Power Density	W/m²	Classroom	4.75	D	4.75
		Conference/Meeting	6.56	C	6.56
		Corridor	4.4	On Continuously	4.4
		Dwelling	5	G	5
		Electrical Mech	3.36	K	3.36
		Lobby	9	H	9
		Lobby for Elevator	7	H	7
		Office	5.58	A	5.58
		Parking Garage	1.5	K	1.5

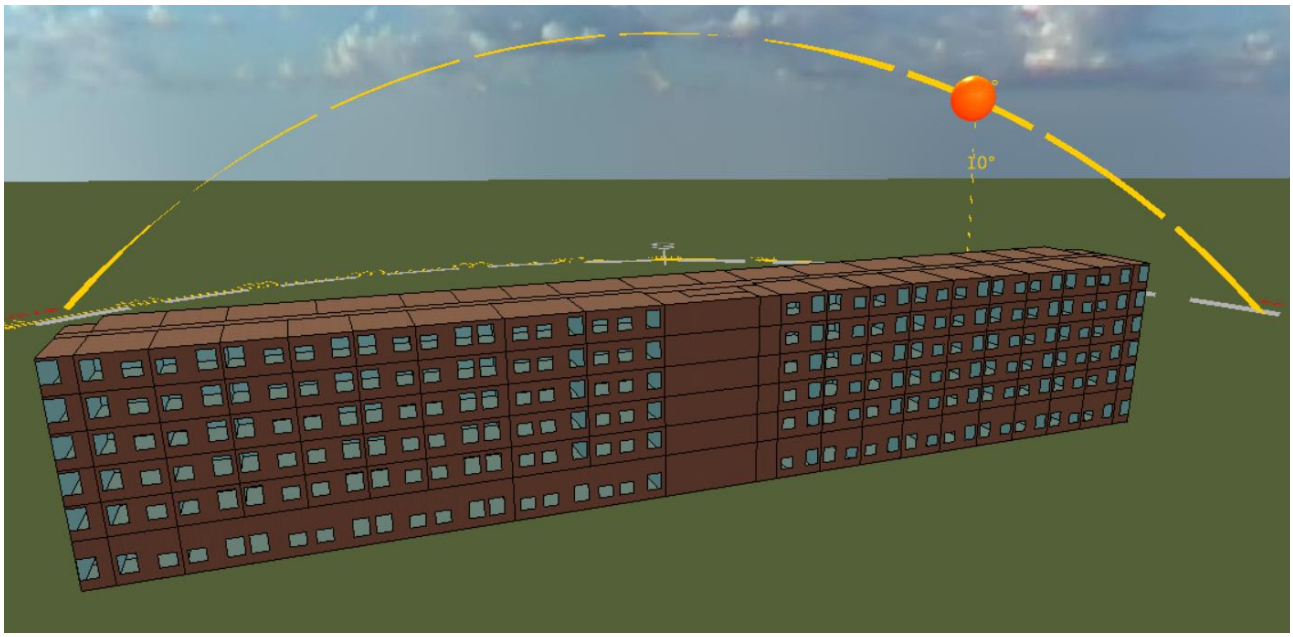
		Stairway	5.3	On Continuously	5.3
		Storage area	2.26		2.26
Occupancy Sensors Installed (Yes/No)	-		Yes		Yes, based on NECB 2017 Table 4.2.1.6
Occupancy Control Power Adjustment	-		Based on NECB 2017 Space Types - NECB 2017 8.4.3.4-2		Based on NECB 2017 - 8.4.4.5-3 for required space types
Daylight Sensors (Yes/No)	-		Yes		Yes
Exterior Lighting Power	kW				
Receptacle Loads	W/m²		Classroom	5.0	As per NECB space type (NECB Table A-8.4.3.3(1)A) Same as proposed
			Conference/Meeting	1.0	
			Dwelling	5.0	
			Electrical/Mechanical	1.0	
			Lobby for Elevator	1.0	
			Lobby	1.0	
			Office	7.5	
			Storage area	1.0	
Elevators	kW		2 x 3		2 x 3

Table 7 Modelling Input Summary of HVAC and DHW Systems

HVAC			
DHW	Plant	Electric	Natural Gas furnace 90% efficient as per NECB 2020
		Electrical system	
	Flow Control	Constant Flow	Constant Flow

		Recirculation	Recirculation
	DHW Flow rate (l/hr)	Suites: 2,754.4 Daycare: 41.1 Office: 14.4 Amenity: 32.4	Same as proposed
	Number of Occupants	NECB G	Same as proposed
	Consumption Pattern Profile	NECB G DHW	Same as proposed
Heating and Cooling Plant	Heating	Air-source heat pump (COP-3.2) with ERV in each unit Heat pump minimum operating temperature: -20 50% capacity @-15°C, COP=1.8 100% Capacity @8.33°C, COP=3.2	Heating using natural gas boilers 90% efficiency as per NECB 2020.
	Cooling	Air-source heat pump (COP-3.4)	Cooling – DX coils-COP 3.2
Pumps	HWL	N/A	311 W/l/s Constant speed
Ventilation Rate	Suites	Ventilation provided by in suite ERV Studio and 1 Bed: 60 cfm 2 Bed: 80 cfm	Same as proposed
	All other spaces	Ventilation as per ASHRAE 62.1	
	Corridor MUA	15 cfm (7 l/s) per door corridor pressurization	
Fan	Suites	667 PA at 70% motor efficiency	System 3: 640 Pa at 40% efficiency
	MUA	1190 Pa at 70% motor efficiency	MUA: Supply Fan: 1000 Pa at 55% eff. Return Fan: 250 Pa at 30% eff
ERV	Suites	Sensible Efficiency: 70% Latent Efficiency: 60%	No HRV in dwelling units
	Corridor MUA	N/A	50% ERV in DOAS system
Unit Heater	Stair, Vestibule, Storage	Electric unit heater	Same as proposed

APPENDIX B – MODEL RENDER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