DESIGN DEVELOPMENT STAGE ENERGY MODELLING REPORT

2636 Eglinton West

2640, 2642, and 2654 Eglinton Avenue West and 1856 and 1856A Keele Street
Toronto, ON

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Fora Developments

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Executive Summary

EQ Building Performance has created an energy model for 2636 Eglinton West located at 2634, 2636, 2640, 2642, and 2654 Eglinton Avenue West and 1856 and 1856A Keele Street in Toronto, ON for the purposes of

Table i indicates the project, as per the inputs described in this report and its appendices, is currently on track to meet the listed performance metrics of Toronto Green Standard v4 Tier 1, following the absolute targets compliance path.

Table i - Savings Summary

Metric	Proposed Design	TGS v4 Tier 1	Target Met?
Energy use Intensity (ekWh/m2)	111.6	135	YES
Greenhouse Gas Intensity (kgCO2e/m2)	9.5	15	YES
Thermal Demand Intensity (ekWh/m2)	45.8	50	YES

The Key Energy Efficiency measures that contribute to this performance include:

- High performance glazing: low-e coating, thermally broken Al frames, Argon fill, warm edge spacers
- Ground source heat pump system
- HP cooling COP 3.4, HP heating COP 3.4
- In-suite and amenity ERVs
- Condensing heating boiler, 95% efficiency, serving unit heaters
- DHW boiler, 95% efficiency
- ECM motors on all fans
- VFD circulation pumps and domestic cold water booster pumps

A detailed list of energy model inputs and assumptions can be found in Appendix A.

Table of Contents

1.0 Project Summary

2636 Eglinton West is a 33 storey Residential development located at 2634, 2636, 2640, 2642, and 2654 Eglinton Avenue West and 1856 and 1856A Keele Street in Toronto ON. The project consists of residential suites, associated amenities, at grade retail and three levels of underground parking.

Key Characteristics of the energy model are shown in Table 1. An energy model rendering is shown in Figure 1.

Table 1 - Key Energy Model Characteristics

Primary Use/Occupancy	Residential
Secondary Use/Occupancy	N/A
Project Stage	Site Plan Approval
Modelled GFA (m2) *excl. parking	26,129
Suite Count	371
Climate Zone	5A
Weather File	Toronto City Centre CWEC 2020
Key Schedules	Residential - NECB Schedule G
	Circulation - 24/7
	Amenities - NECB Schedule B
	Retail - NECB Schedule C

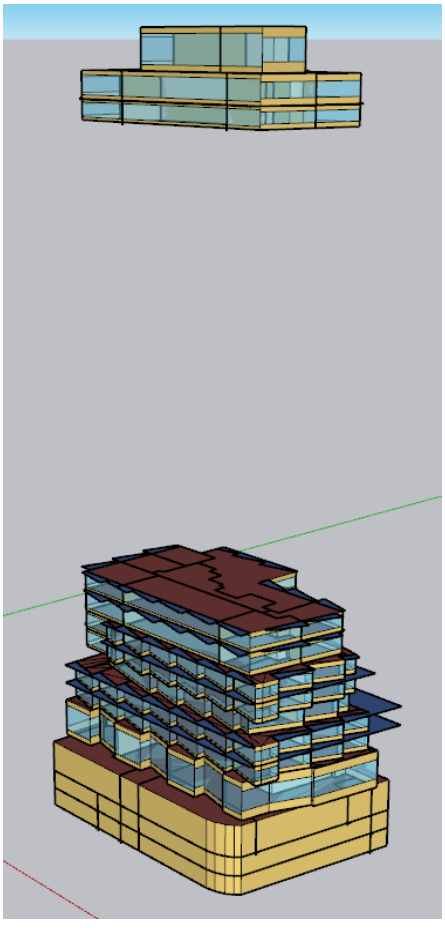

Figure 1 - Energy Model Rendering

2.0 Current Project Goals

The current energy efficiency and conservation goals relevant to the project are presented below. The intent of this report is to analyze only these goals, however it is noted that additional goals may become relevant at different stages depending on project requirements.

TGS v4 Tier 1	Meet the Tier 1 absolute EUI (ekWh/m2), TEDI (ekWh/m2) and GHGI (kg CO2e/m2) targets.

3.0 Background and Definitions

Building energy modelling provides a means to simulate building energy performance during the design stage of a project to quickly and effectively evaluate the impact of various design measures on building energy performance. In addition, building energy modelling allows the predicted building performance to be evaluated against key benchmarks such as the National Energy Code for Buildings (NECB), and ASHRAE 90.1.

The use of energy simulation software to validate energy efficient building design is recognized by programs such as the USGBC's LEED Rating System, Ontario Building Code SB-10, the Toronto Green Standard as well as various incentive and funding programs.

EQ Building Performance has been retained to assess the project's performance using energy modelling software, and to suggest design alternatives to achieve further energy savings where appropriate. Building performance can be assessed in a number of ways depending on the project goals, however are typically defined as one or more of the following:

Energy Use **GJ** Energy Use Intensity (EUI) **ekWh/m^2**	Annual energy use of the building. EUI is annual energy use divided by floor area.
GHG Emissions **kgCO2e** GHG Intensity (GHGI) **kgCO2e/m^2**	Annual greenhouse gas (GHG) emissions produced by the building. GHGI is annual GHG emissions divided by floor area. GHG emission factors vary by fuel type and are often defined by the referenced standard. GHG emission factors are presented in Appendix A.
Thermal Energy Demand **GJ** Thermal Demand Intensity (TEDI) **ekWh/m^2**	Annual space heating thermal demand of the building. TEDI is annual heating demand divided by floor area. Thermal demand is a passive metric, evaluating building enclosure and ventilation system performance while ignoring HVAC system efficiency.
Energy Cost **$** Energy Cost Intensity (ECI) **$/m2**	Estimated annual energy cost of the building. ECI is energy cost divided by modelled gross floor area, not sellable area. Rates vary by utility (e.g. electricity vs natural gas) and are an estimate which should not be relied on for utility budgets. Utility rates used are presented in Appendix A.
Peak Electrical Demand **kW**	Peak monthly electricity demand of the building.

4.0 Methods and References

The building was modelled using Energy Plus v9.3 energy simulation software. EnergyPlus is a widely-recognized hourly energy analysis program developed in collaboration with NREL, various US DOE National Laboratories, academic institutions, and private firms. Energy modelling was performed under the general techniques recognized in the following documents, where relevant and appropriate for the project:

- Energy Efficiency Report Submissions & modelling Guidelines For the Toronto Green Standard (TGS) Version 3. City of Toronto Energy Efficiency Office (Feb 2019).
- Best Practice Guideline for Annual Energy Simulations for Large Buildings. Government of Ontario, Ministry of Municipal Affairs Building and Development Branch (May 2018).
- LEED v4 Reference Guide.

The following project specific documents were used to develop the energy model:

- Architectural drawings prepared by gh3; dated October 6, 2022.
- Mechanical design brief prepared by MCW; dated October 24, 2022.
- Electrical design brief prepared by MCW; dated October 24, 2022.

Additional assumptions may have been used to fill in gaps in information, based on modelling experience and knowledge of building systems.

5.0 Results Summary

A summary of the proposed building design performance as it relates to the current project goals can be see in Table 2.

Table 2 - Energy Model Performance Summary

Metric	Proposed Design	TGS v4 Tier 1	Target Met?
Energy use Intensity (ekWh/m2)	**111.6**	**135.0**	**YES**
Greenhouse Gas Intensity (kgCO2e/m2)	**9.5**	**15.0**	**YES**
Thermal Demand Intensity (ekWh/m2)	**45.8**	**50.0**	**YES**

Table 2 indicates the project, as described in this report and its appendices, is currently on track to meet the listed performance metrics of Toronto Green Standard v4 Tier 1. A detailed list of energy model inputs and assumptions can be found in Appendix A, however the key energy efficiency measures that contribute to this performance include:

- High performance glazing: low-e coating, thermally broken Al frames, Argon fill, warm edge spacers
- Ground source heat pump system
- HP cooling COP 3.4, HP heating COP 3.4
- In-suite and amenity ERVs
- Condensing heating boiler, 95% efficiency, serving unit heaters
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6.0 Detailed Results and End Use Breakdown

An end use breakdown of the results can be seen in Table 3 and Figure 2, and a detailed list of energy model inputs and assumptions can be found in Appendix A.

Table 3 - Detailed Results Breakdown

End Use	Proposed Design		Intensity	
	Electricity (GJ)	Natural Gas (GJ)		
Interior Lighting	1,949	0	20.7	ekWh/m2
Misc Eqp. / Plug Loads	2,122	0	22.6	ekWh/m2
Heating	1,080	269	14.3	ekWh/m2
Cooling	569	0	6.0	ekWh/m2
Pumps	2	0	0.0	ekWh/m2
Fans	902	0	9.6	ekWh/m2
Domestic HW	0	3,573	38.0	ekWh/m2
Exterior Lighting	31	0	0.3	ekWh/m2
Annual Energy (GJ) / EUI	**10,496**		**111.6**	**ekWh/m2**
Annual GHG Emissions (kg CO2e) / GHGI	**248,385**		**9.5**	**kgCO2e/m2**
Annual Energy Cost ($) / ECI	**$258,781**		**$11.45**	**$/m2**
Annual Thermal Demand (GJ) / TEDI	**4,307**		**45.8**	**ekWh/m2**

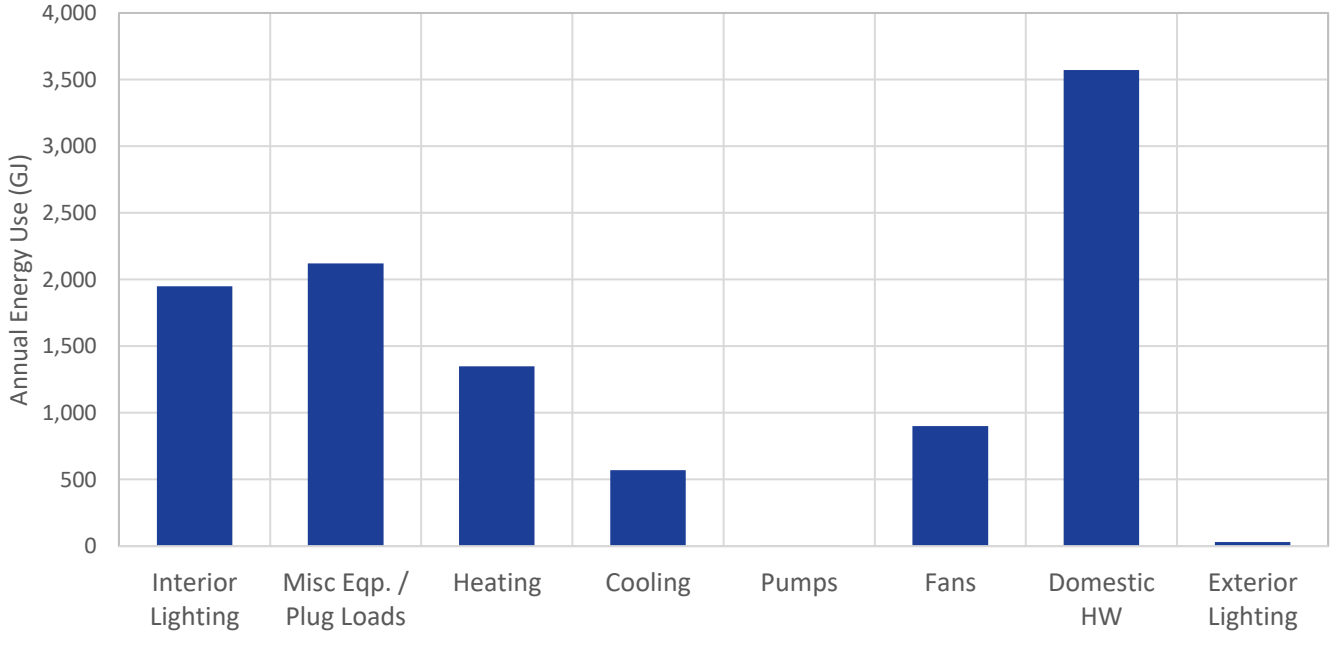

Figure 2 - Annual Energy End Use Breakdown (GJ)

Figure 3 demonstrates how the building performs in relation to Tiers 1 through 4 of version 4 of the Toronto Green Standard, in terms of the three absolute performance metrics - Energy Use Intensity (EUI), Greenhouse Gas Intensity (GHGI), and Thermal Demand Intensity (TEDI). For context, Tier 4 is meant to represent a Net-Zero Ready or Passive House level of building performance.

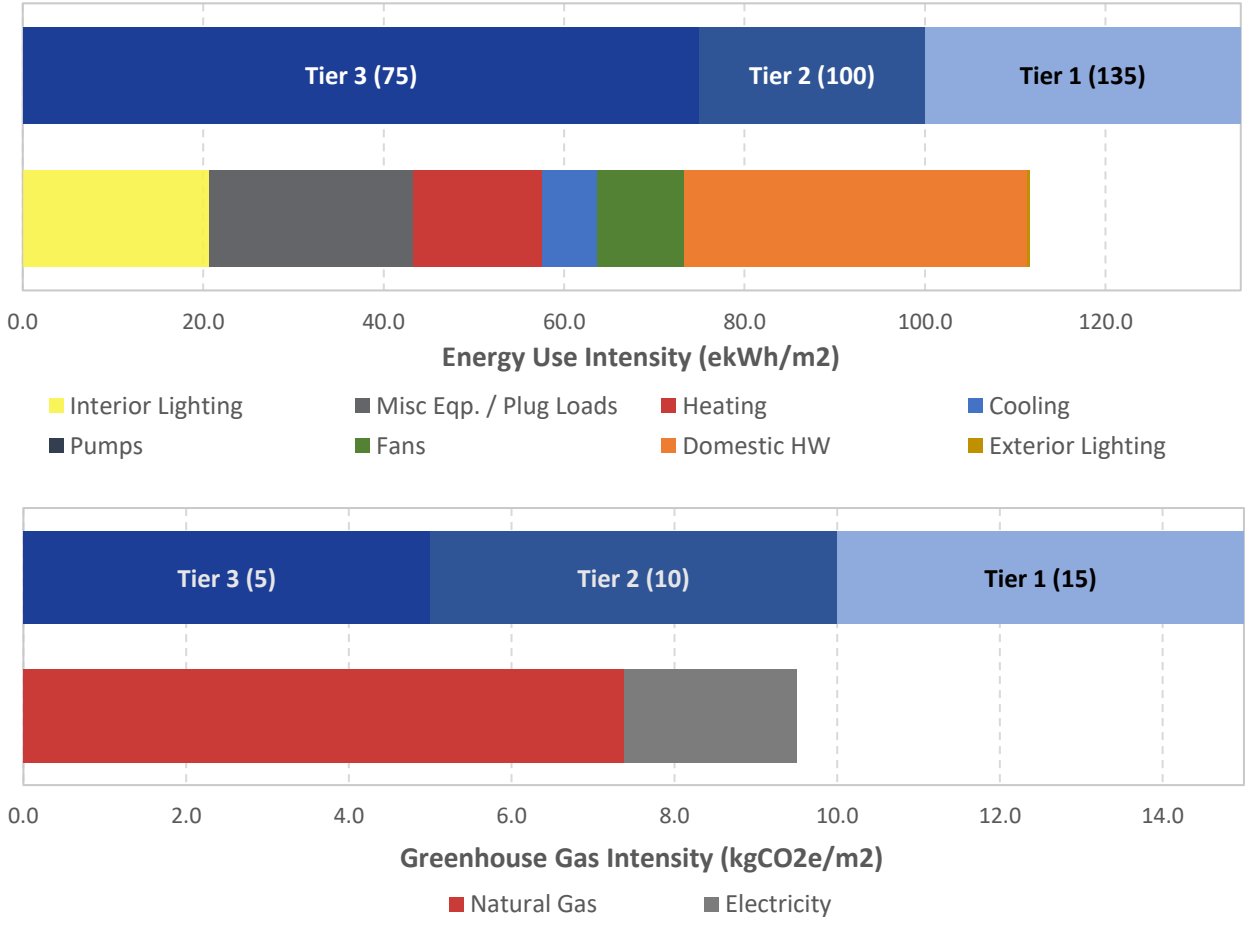

Figure 3 - Annual EUI and GHGI and Comparison to TGS Metrics

Figure 4 shows a breakdown of annual *Energy Use* , annual *Energy Cost* and annual *GHG Emissions* by utility. This demonstrates the importance of utility type to each metric and can assist project teams in focusing any further efforts depending on project efficiency goals. GHG emission factors and energy cost rates are presented in Appendix A.

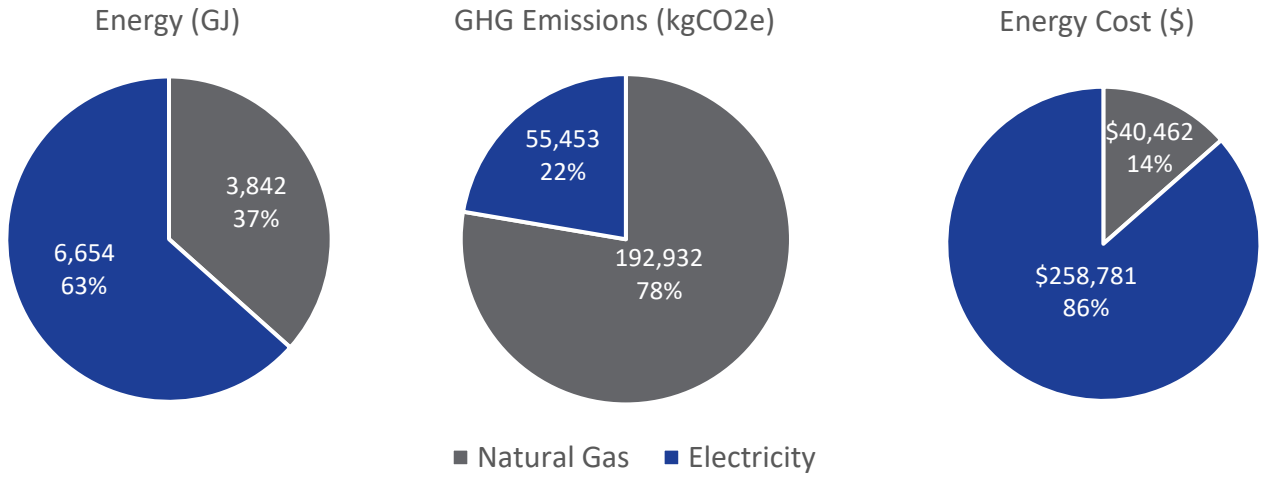

Figure 4 - Annual Energy (GJ), GHG Emissions (kgCO2e) and Energy Cost ($) by Utility

7.0 Disclaimer and Next Steps

A detailed list of model inputs are provided in Appendix A. The ability of a building design to achieve the stated project goals remains the responsibility of the design team. The design team should review the report and appendices to ensure all inputs and assumptions are accurate, or represent a conservative estimate of performance.

In addition, the architect, mechanical and electrical engineer must ensure any mandatory requirements of the energy code referenced are met with the building design. If relevant, mandatory requirements checklists will be provided by EQ Building Performance alongside this report, which must be filled in and signed by the design team.

Please don't hesitate to contact EQ Building Performance with any questions or comments regarding the energy modelling of this project.

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Appendix A - Model Inputs and Assumptions

The characteristics of the proposed and reference models, as applicable, are listed below:

Input	Proposed Design	Notes
Weather File	Toronto City Centre CWEC 2020	
Climate Zone	5A	
Building Enclosure		
Steel Framed Wall	**EX-5a** 40 mm face brick or stone 100 mm EPS insulation 75 mm spray foam insulation between 150 mm steel studs Nominal R-32.4, Effective R-23.1	Ground and 2nd floor
Steel Framed Wall	**EX-4** 100 mm EPS insulation 150 mm batt insulation between steel studs Nominal R-39.4, Effective R-23.7	3rd floor and above
Steel Framed Wall	**Average Opaque Wall** Accounts for full Thermal Bridging, including: > Slab Edge Bypass > Corners > Roof Parapets > Balconies > Window Perimeters **Effective R-5.5**	
Roof	150 mm rigid insulation Nominal R-30 Effective R-30	
Glazing	Double-Pane, Low-E Coating, Argon Fill Thermally broken aluminum framing Total U-0.35, SHGC-0.35	
Window Wall Ratio	Overall: 60.7%	
Infiltration Rate	0.25 L/s/m^2 at 5Pa, per TGS v3 modeling rules. No credit taken for reduced infiltration rate.	

Input	Proposed Design		Notes
Electrical Loads			
Interior Lights	Per SB-10		
	Suites	0.46 W/ft2	
	Corridors	0.66 W/ft2	
	Stairway	0.58 W/ft2	
	Parking Garage	0.14 W/ft2	
	Sales / Retail	1.22 W/ft2	
	Amenity	1.07 W/ft2	
	Lobby	1 W/ft2	
	Overall:	**0.47 W/ft2**	
General Plug Loads	Per SB-10		
	Suites	0.46 W/ft2	
	Corridors	0 W/ft2	
	Stairway	0 W/ft2	
	Parking Garage	0 W/ft2	
	Sales / Retail	0.8 W/ft2	
	Amenity	0.09 W/ft2	
	Lobby	0.09 W/ft2	
	Overall:	**0.33 W/ft2**	
Exterior Lights	Estimated Total: 2 kW		
Additional Misc / Process Loads	Additional energy use estimated for: Parking Garage Fans Misc. Common Fans and Pumps Domestic Cold Water Booster Pumps (VFD)		
HVAC Plant			
Heating Plant	95% condensing boilers serving all unit heaters Loop temp: 160F / 40F delta T Variable speed pumps / 2 way valves		
Ground Source Heat Pump Plant	Vertical Field 77 x 600 ft boreholes Variable speed pumps		estimated

Input	Proposed Design	Notes
HVAC Systems		
In Suite	**Ground Source Heat Pump** Served by Heat Pump Loop **DX Heating:** COP-3.4 **DX Cooling:** COP-3.4 **Fans:** EC motors - 0.3 W/cfm **Ventilation:** Provided by In-suite ERVs > 70% sensible effectiveness. > Total 1 W/cfm fan power	
Corridors	**Ground Source Heat Pump** Served by Heat Pump Loop **DX Heating:** COP-3.4 **DX Cooling:** COP-3.4 **Fans:** 1.0 W/cfm **Ventilation:** 100% OA System, serves other spaces as noted	
Amenities	**Ground Source Heat Pump** Served by Heat Pump Loop **DX Heating:** COP-3.4 **DX Cooling:** COP-3.4 **Fans:** EC motors - 0.3 W/cfm **Ventilation:** Provided by ERVs > 70% sensible effectiveness. > Total 1 W/cfm fan power	
Lobby	**Ground Source Heat Pump** Served by Heat Pump Loop **DX Heating:** COP-3.4 **DX Cooling:** COP-3.4 **Fans:** EC motors - 0.3 W/cfm **Ventilation:** Provided by Corridor AHU	
Retail Space	**Ground Source Heat Pump** Served by Heat Pump Loop	

Input	Proposed Design	Notes
	DX Heating: COP-3.4 **DX Cooling:** COP-3.4 **Fans:** EC motors - 0.3 W/cfm **Ventilation:** Provided by Corridor AHU	
Ventilation	Corridor AHU(s): 30 cfm/door average flow Suites: 55 cfm/ERV average flow Amenities: per ASHRAE 62.1-2007 **Total:** **~33,300 cfm**	
Domestic Hot Water		
Hot Water Plant	95% condensing boilers	
Plumbing Fixtures	Low Flow per Design: Showerheads: 6.8 LPM (1.8 GPM) Lav Faucets: 4.5 LPM (1.2 GPM) Kitchen Sinks: 5.7 LPM (1.5 GPM)	
Utility Rates		
Electricity	Assumed, per current market prices: 0.14 $/kWh	
Natural Gas	Assumed, per current market prices: 0.4 $/m3	
Greenhouse Gas Emissions Factors		
Electricity	Per OBC SB-10, Table 1.1.2.2: 0.030 kgCo2e/kWh	
Natural Gas	Per OBC SB-10, Table 1.1.2.2: 1.899 kgCO2e/m3	