DESIGN DEVELOPMENT STAGE ENERGY MODELLING REPORT

15-17 Elm St

15-17 Elm St
Toronto, ON

August 30, 2022
Revision: 0

Issued for:
Site Plan Approval

Issued to:
Fora Developments

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Executive Summary

EQ Building Performance has created an energy model for 15-17 Elm St located at 15-17 Elm St in Toronto, ON for the purposes of Toronto Green Standard v4 Tier 1.

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)	111.0	135	YES
Greenhouse Gas Intensity (kgCO2e/m2)	8.9	15	YES
Thermal Demand Intensity (ekWh/m2)	51.8	50	NO

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

- Ground loop heat pumps for heating and cooling
- Energy recovery ventilators for suites (min 73% sensible effectiveness)
- Energy recovery ventilators for amenities (min 70% sensible effectiveness)
- Low-flow plumbing fixures (6.6lpm showers, 5.7lpm lavs and sinks)
- Low corridor pressurization rate (25cfm/door)
- Low window to wall ratio (33.2%)
- High performing window wall system (R-6.7 effective)

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

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1.0 Project Summary

15-17 Elm St is a 30 storey Residential development located at 15-17 Elm St in Toronto ON. The project consists of residential suites, associated amenities, retail space and two 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	NA
Project Stage	Site Plan Approval
Modelled GFA (m2) *excl. parking	15,339
Suite Count	174
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

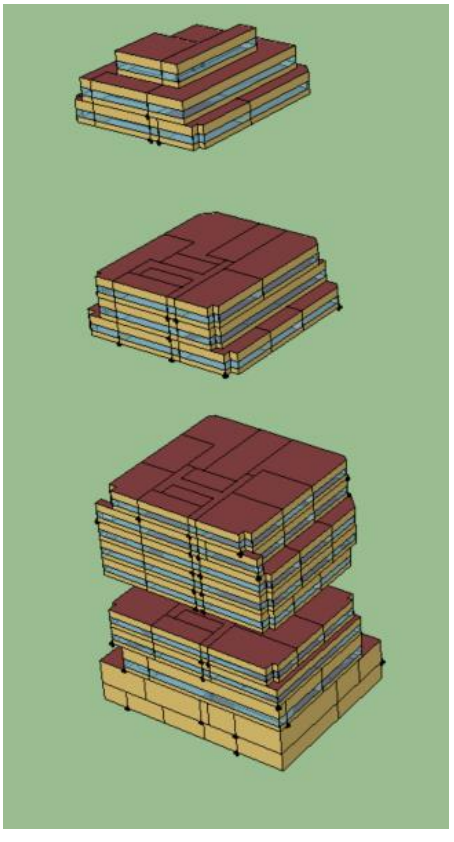

Figure 1 - Energy Model Rendering

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 v9.6 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 Partisans; dated August 22, 2022.
- Mechanical design brief prepared by MCW; dated he c.
- Electrical design brief prepared by MCW; dated August 9, 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)	**111.0**	**135.0**	**YES**
Greenhouse Gas Intensity (kgCO2e/m2)	**8.9**	**15.0**	**YES**
Thermal Demand Intensity (ekWh/m2)	**51.8**	**50.0**	**NO**

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:

- Ground loop heat pumps for heating and cooling
- Energy recovery ventilators for suites (min 73% sensible effectiveness)
- Energy recovery ventilators for amenities (min 70% sensible effectiveness)
- Low-flow plumbing fixures (6.6lpm showers, 5.7lpm lavs and sinks)
- Low corridor pressurization rate (25cfm/door)
- Low window to wall ratio (33.2%)
- High performing window wall system (R-6.7 effective)

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	1,103	0	20.0	ekWh/m2
Misc Eqp. / Plug Loads	1,185	0	21.5	ekWh/m2
Heating	943	151	19.8	ekWh/m2
Cooling	366	0	6.6	ekWh/m2
Pumps	27	0	0.5	ekWh/m2
Fans	443	0	8.0	ekWh/m2
Domestic HW	0	1,883	34.1	ekWh/m2
Exterior Lighting	31	0	0.6	ekWh/m2
Annual Energy (GJ) / EUI	**6,132**		**111.0**	**ekWh/m2**
Annual GHG Emissions (kg CO2e) / GHGI	**136,293**		**8.9**	**kgCO2e/m2**
Annual Energy Cost ($) / ECI	**$159,376**		**$11.51**	**$/m2**
Annual Thermal Demand (GJ) / TEDI	**2,861**		**51.8**	**ekWh/m2**

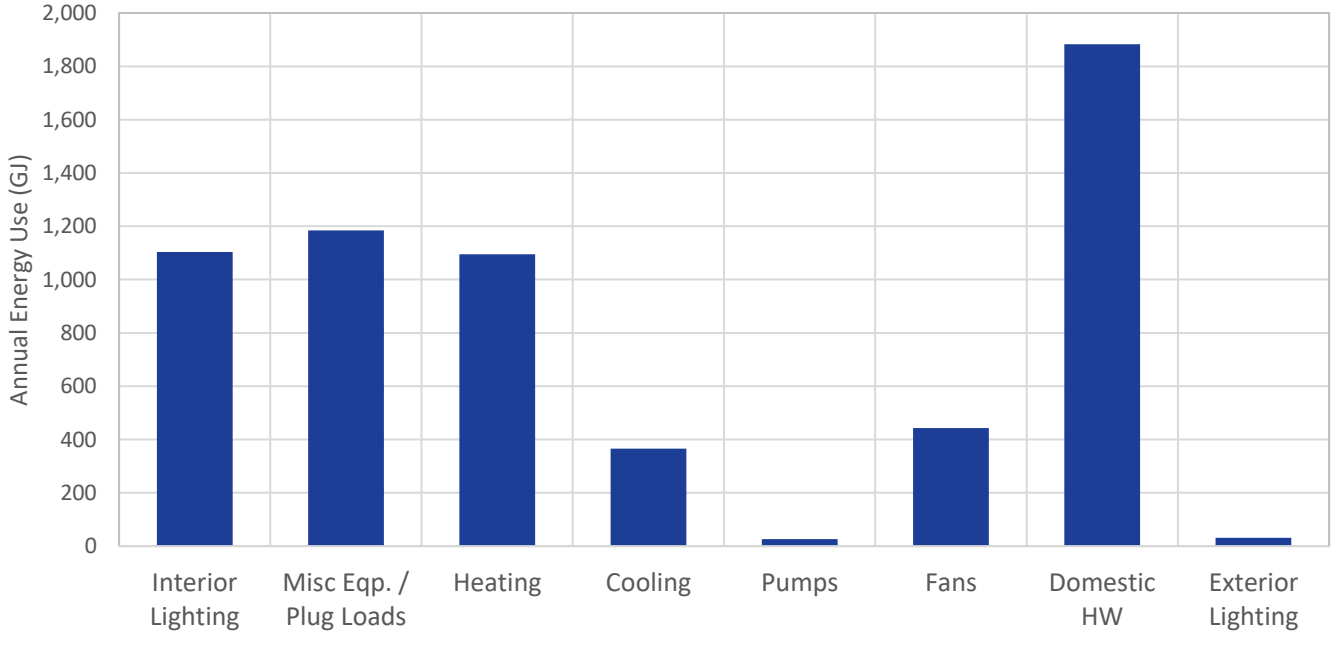

Figure 2 - Annual Energy End Use Breakdown (GJ)

Figure 3 demonstrates how the building performs in relation to Tiers 1 through 4 of version 3 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.

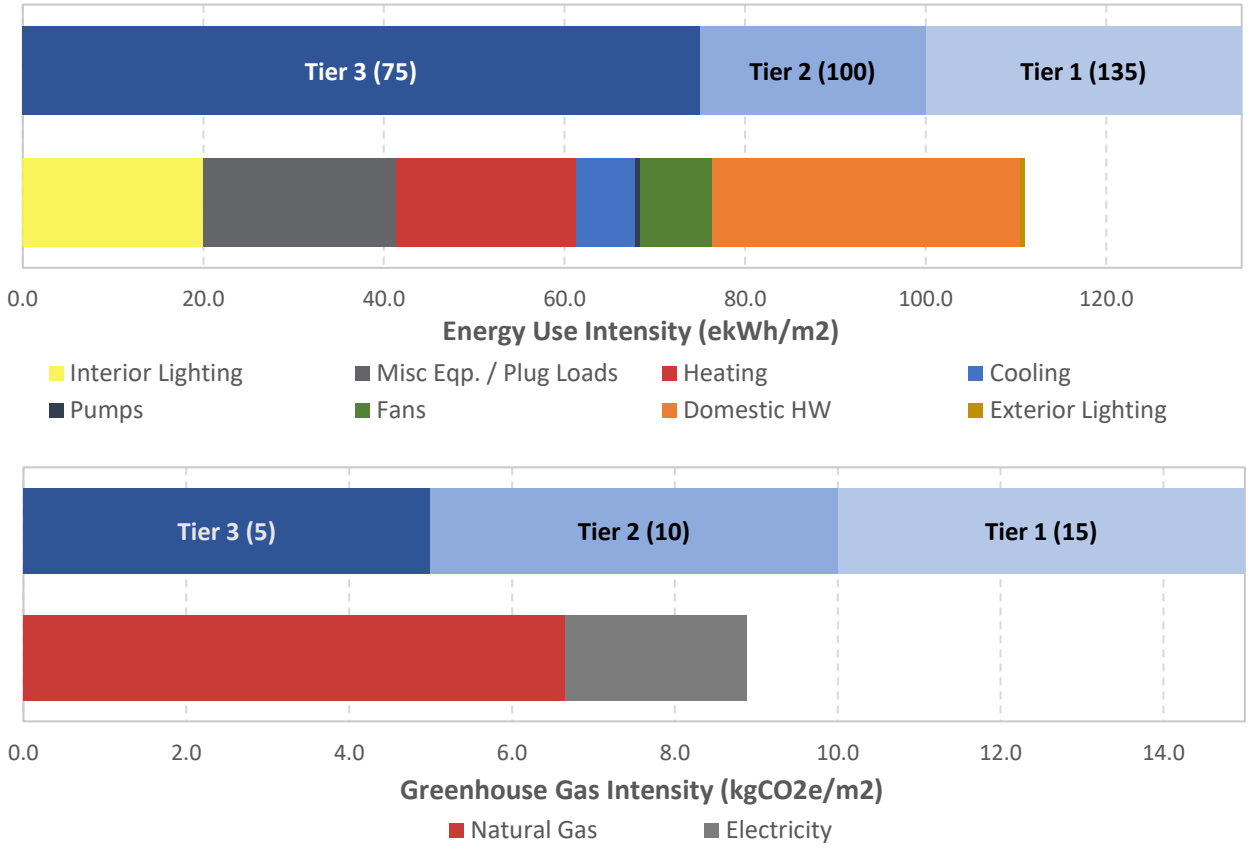

Figure 3 - Annual EUI and GHGI and Comparison to TGS Metrics

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.

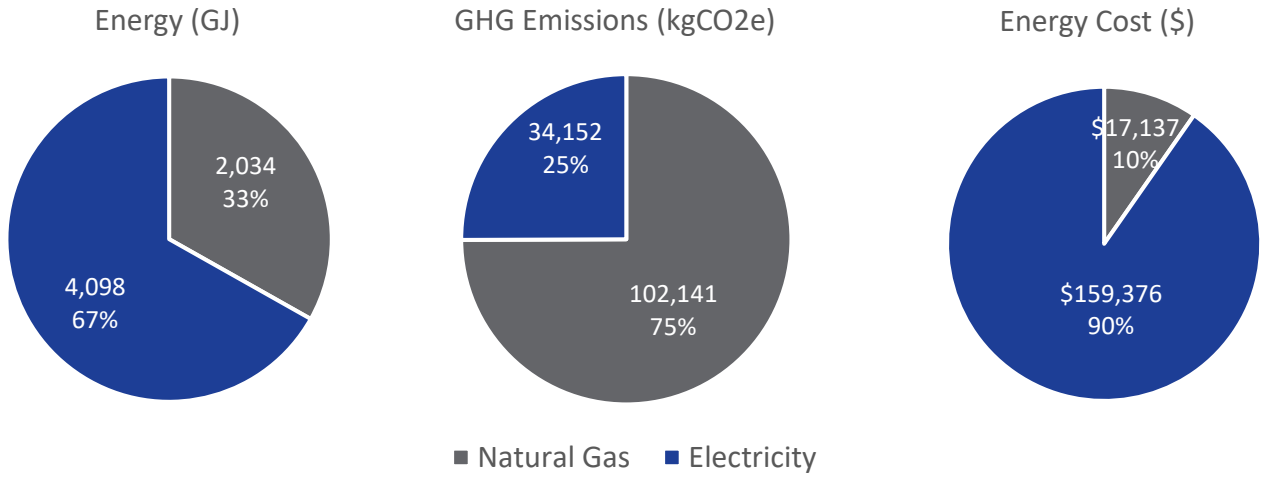

Figure 4 - Annual Energy (GJ), GHG Emissions (kgCO2e) and Energy Cost ($) by Utility

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	Precast panel 50mm semi-rigid insulation (R-8.4) 100mm metal studs **Effective R-12.5**	(100% of total opaque wall)
Overall effective R-value	**Effective R-6.7**	After accounting for thermal bridging effects of balconies, slab edges, window perimeter, terraces and parapets
Roof	150mm rigid insulation (R5/in) **Effective R-31.7**	
Glazing	Double glazed, low-e coating, double pane windows, argon fill, warm edge spacers and thermally broken aluminum frames **Total assembly: U-0.33 SHGC: 0.35**	
Window Wall Ratio	Overall: 33.2%	
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	5 W/m2	
	Corridors	7.1 W/m2	
	Stairway	6.24 W/m2	
	Parking Garage	1.51 W/m2	
	Sales / Retail	13.13 W/m2	
	Lobby	10.76 W/m2	
	Amenity	11.51 W/m2	
	Overall:	**4.7 W/m2**	
General Plug Loads	Per SB-10		
	Suites	5 W/m2	
	Corridors	0 W/m2	
	Stairway	0 W/m2	
	Parking Garage	0 W/m2	
	Sales / Retail	8.6 W/m2	
	Lobby	1 W/m2	
	Amenity	1 W/m2	
	Overall:	**3.5 W/m2**	
Exterior Lights	Per Design:		
	Total: 2 kW		Assumed
Additional Misc / Process Loads	Additional energy use estimated for:		
	Parking Garage Fans		
	Elevators		
	Misc. Common Fans and Pumps		
	Domestic Cold Water Booster Pumps (VFD)		
HVAC Plant			
Heat Pump Loop	Ground loop system		
	Loop temp between 41F/33F		
	Variable speed pumps / isolation valves		

Input	Proposed Design	Notes
HVAC Systems		
Suite	**Water Source Heat Pump** Served by Heat Pump Loop **DX Heating:** COP - 3.3 **DX Cooling:** EER - 14.7 **Fans:** EC motors - 0.3 W/cfm **Ventilation:** Provided by In-suite ERVs > 73% sensible effectiveness. > Total 1 W/cfm fan power	
Amenity **Retail**	**Water Source Heat Pump** Served by Heat Pump Loop **DX Heating:** COP - 3.3 **DX Cooling:** EER - 14.7 **Fans:** EC motors - 0.3 W/cfm **Ventilation:** Provided by ERVs > 70% sensible effectiveness. > Total 1 W/cfm fan power	
Lobby	**Water Source Heat Pump** Served by Heat Pump Loop **DX Heating:** COP - 3.3 **DX Cooling:** EER - 14.7 **Fans:** EC motors - 0.3 W/cfm **Ventilation:** Provided by Corridor AHU	
Corridor AHU	**Corridor AHU** Served by Heat Pump Loop **DX Heating:** COP - 3.3 **DX Cooling:** EER - 14.7 **Fans:** Estimated 1W/cfm **Ventilation:** 100% OA System, serves other spaces as noted	

Input	Proposed Design	Notes
Ventilation	Per Design: Corridor AHU(s): 30 cfm/door average flow after TOU schedule applied Suites: 52.5 cfm/ERV average flow after TOU schedule applied Amenities: per ASHRAE 62.1-2007	75 cfm/ERV peak flow
Domestic Hot Water		
Hot Water Plant	95% condensing boilers / DHW heaters	
Plumbing Fixtures	Low Flow per Design: Showerheads: 6.6 LPM (1.75 GPM) Lav Faucets: 5.7 LPM (1.5 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: 0.32 $/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	