1365-1375 Yonge Street - Energy Strategy

For

Yonge and Rosehill Inc.

Project Location

1365-1375 Yonge Street, Toronto, Ontario

Footprint Project Number

23142-001

Date

2023-05-25

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Table of Contents

Executive Summary

The following report presents the findings of the energy study performed for Yonge and Rosehill Inc. the proposed residential development located at 1365-1375 Yonge Street, Toronto, Ontario.

The purpose of this report is to provide an energy strategy that will help the proposed building design to achieve the compliance with Toronto Green Standards (TGS), and explore the opportunities toward achieving net zero development. The strategies identified evaluate opportunities to reduce energy demand and emissions, including embodied carbon, and to be resilient to climate change. It recommends technically and financially viable solutions for further analysis and implementation during Site Plan Control approvals.

This report is in support of a Zoning Bylaw Amendment application and the Official Plan *Amendment* application.

PROPOSED DEVELOPMENT

A summary of the proposed development statistics can be found below:

- Total GFA: 45,919 sqm
- Total floors, including mechanical penthouse: 51
- High-Rise Tower: 51 storeys
- Below Grade: 5 levels of parking

ENERGY CONSERVATION DESIGN FEATURES

The design assumptions were determined from available information with the intent of meeting the energy requirement of Toronto Green Standard (TGS) v3 Tier 1, a minimum code requirement, and with the goal to strive for a higher level of energy performance. The detailed energy model inputs can be found in Appendix A. The following Energy Conservation Measures (ECMs) are incorporated in this proposed building design to meet Tier 1 standards. Details regarding the ECMs implemented to reach Tier 2 and 3 can be found in the *Energy Conservation Measures* section.

- Opaque envelope performance with overall R-6.5 effective (including thermal bridging) for walls and R-30 roofs,
- Glazing performance: U-0.365 and a 0.33 SHGC;
- 40% Window to Wall Ratio (WWR)
- Corridor Ventilation 40 cfm/suite with 50% nighttime and summer setback schedule
- In suite ventilation energy recovery provided for dwelling units - 70% sensible effectiveness
- Low-flow fixtures: lavatories 1.0 gpm, showerheads 1.75gpm, and kitchen faucets 1.75gpm

- High efficiency condensing boilers and chillers
- High efficiency condensing gas-fired service water heater

ENERGY PERFORMANCE

The energy use intensity (EUI) of the proposed design is 152.2 ekWh/sqm, meeting (TGS) v3 Tier 1 targets for total EUI, TEDI and GHG emissions.

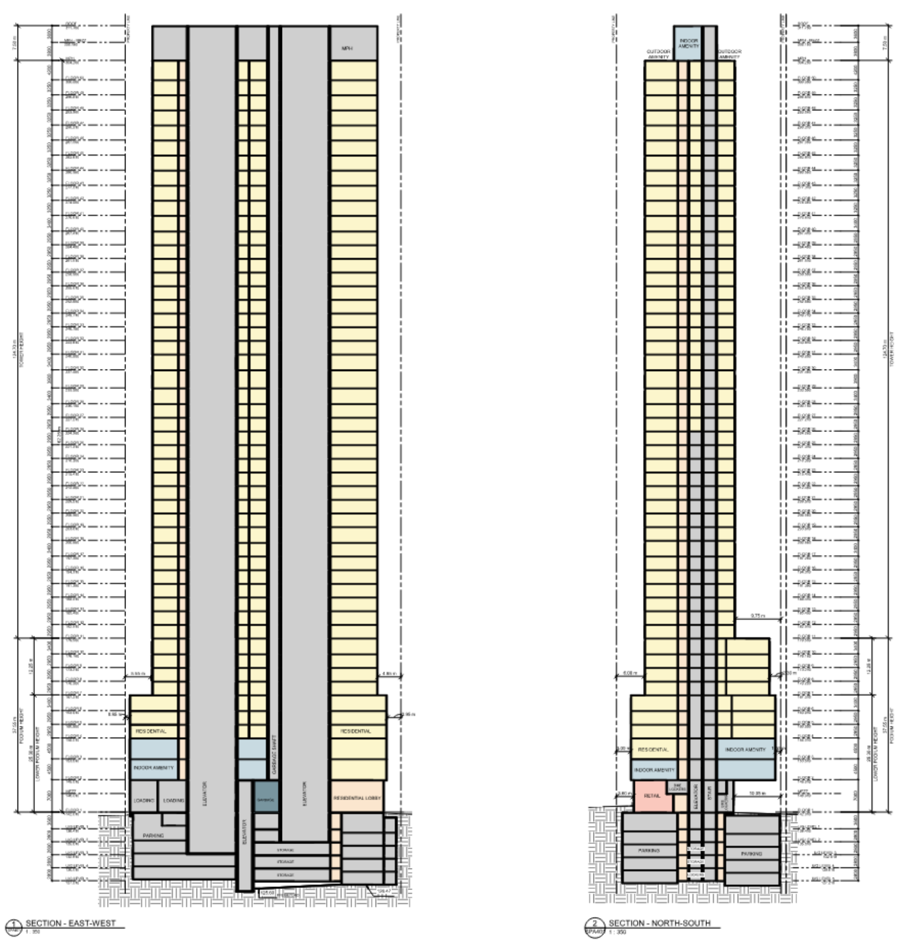
Design Case	Description	TEUI (kWh/m^2)	TEDI (kWh/m^2)	GHGI (kg $eCO2/m^2$)
Proposed Tier 1	As per ECM Summary	152.2	51.2	18
Proposed Tier 2	As per ECM Summary	134.8	44.1	14.1
Proposed Tier 3	As per ECM Summary	99.1	25	7.5

Base Building Design Description

MASSING & ORIENTATION

The nature of the site and purpose of the proposed development lends itself to a large amount of occupied perimeter spaces.

The window-to-wall ratio (WWR) for the Building based on the preliminary design information is assumed to be 40% in the current design.



DAYLIGHTING

The proposed building's form and function promote daylighting mainly for residential units, as all units have exterior glazed exposure.

THERMAL PERFORMANCE

Thermal performance values are based on preliminary envelope assembly information provided by the architect.

- Exterior wall performance which includes spandrel panel with back pan insulation including impact of balcony slab edge, was rated at R-6.5
- Roof: R-30
- Roof/Soffit/Parking Garage plenum: R-20
- Glazing System U value is set to 0.365 Btu/h sf °F. Overall U value is estimated based on typical curtain wall sizes.

LIGHTING

The baseline lighting targets are set equal to 15% better than the 2017 Ontario Building Code SB-10 requirements. LED lighting fixtures are required in the proposed design to achieve these lighting power density targets.

APPLIANCES

All in-suite appliances have been set to ENERGY STAR® minimum requirements.

HEATING AND COOLING

Conventional Central Heating Plant

Central boilers and chillers will serve the TGS compliant SB-10 model. The following summarizes the baseline mechanical design. Detailed model inputs and performances can be found in Appendix A.

- Central Heating and cooling are provided by a chilled and heating water loop connected to high efficiency natural gas hot water heaters and chiller/cooling tower system.

VENTILATION

Dwelling unit ventilation is provided by in suite energy recovery ventilators, whereas lobby and amenity ventilation as well as corridor pressurization is provided by a hydronic make up air unit.

Amenity and corridor ventilation accounts for over 30% of the total proposed design ventilation. Measures to reduce the corridor ventilation load are explored in the Appendix A.

The ventilation is provided by MUAs connected to hot and chilled water loops.

DOMESTIC HOT WATER

Domestic hot water is provided by high efficiency condensing domestic water heaters. Low flow fixtures have been incorporated into the proposed design. Opportunity to further reduce the domestic hot water load is assessed as a conservation measure.

Energy Conservation Measures

Energy conservation measures were determined by first examining where the proposed building design loads could be reduced. Several load reduction measures have been incorporated into the proposed design: good envelope performance, ventilation energy recovery in residential suites, effective AHU scheduling, and low flow plumbing fixtures. The following areas provide the most opportunity for further load reduction:

- Glazing
- Domestic Hot Water
- Corridor Ventilation
- Building Air Tightness
- Mechanical System Type

GLAZING

Reduced Glazing Area

Heat loss and heat gains through glazing are major contributors to heating and cooling loads. Reducing the total glazed area is the most cost-effective way to reduce energy consumption. Designing to achieve a 40% window to wall ratio is ideal from an energy perspective as this helps reduce cooling loads and heating losses, while allowing enough glazing area to maintain daylighting and sufficient heat gain during bright winter and shoulder season days.

Improved Window Performance

In addition to conventional double glaze system with lower solar heat gain coefficient (SHGC) of 0.33, different glazing performance measures can be adopted to improve the performance such as:

- High-performance double glaze system with a SHGC value of 0.40 to allow more passive heating
- Triple glaze system with a SHGC value of 0.40 to allow more passive heating

There is a trade-off between heating and cooling loads, as reduced solar heat gain increases heating loads. The cost of electricity is much higher than natural gas, so reducing the solar heat gain coefficient will reduce energy costs far more than energy and emissions. Reducing solar heat gain coefficients is achieved through various low-e coatings and is less expensive than improving both U-value and solar heat gain coefficient. Window U-value improvements are achieved through increasing the number of panes (i.e. triple glazed) or increasing the thermal break of aluminum frames. In the analyzed models, all glazing constructions were assumed to have a U value of 0.365 BTU/(hrFf^2) in order to meet Tier 1, 2 standards, and U value of 0.25 BTU/(hrFf^2) in order to meet Tier 3 standards.

ENVELOPE DESIGN AND CONSTRUCTION

Wall Thermal Performance

The wall thermal performance is impacted by the assemblies at the envelope of the building. In general, thicker assemblies with higher quality insulation will optimize the envelope performance. An insulation rating of R-6.5, R-8, and R-10 were used to achieve TGS v3 Tiers 1, 2, and 3, respectively.

Based on the preliminary architectural drawings, the following wall constructions were assumed:

- Spandrel panels, consisting of the window wall assembly, batt insulation, metal studs, vapour barrier, and gypsum board
- Curtain wall system, consisting of back-painted spandrel, insulation board, galvanized metal back pan, batt insulation, metal studs, vapour barrier, and gypsum board

Balconies and Thermal Bridging

Thermal bridging calculations must be performed and submitted to the City of Toronto to comply with TGS v3. These calculations can result in a degradation of the envelope R-values by over 70%. Thermal bridging occurs at any interaction between building components (Ex. windows to wall, wall to balcony). The most significant thermal bridging happens at slab balconies. Using thermally broken balconies would greatly improve the energy performance of the building, but come at a cost premium.

Roof Insulation

Improving roof insulation is another way to minimize heat loss through the building envelope. Roofs generally experience significantly lower thermal bridging, and therefore demonstrate a much higher R-value than the walls. A roof R-value of 30 is modelled in order to meet Tier 1, 2, and 3 standards.

MASSING AND FORM OPTIONS

Two additional large drivers of energy efficiency for residential building are the surface area to floor area ratio and the number of suites per square foot. All energy metrics are calculated per unit of floor area, therefore an increase in envelope losses per unit of floor area, or suite energy consumption per floor area, can affect the performance of the building.

A greater exterior wall surface area results in higher infiltration rates, therefore decreasing the building perimeter will decrease the total heat loss. This can be achieved by using a square footprint shape rather than rectangular, and eliminating protrusions from the building, in order to minimize the exposed surface area of the envelope.

The development meets Tier 1, 2, and 3 standards without reducing the infiltration rates. Although, implementing lower infiltration rates can help meeting new targets and providing more flexibility in the design, allowing for a higher window-to-wall ratio, and greater lighting and equipment loads. To reduce infiltration, quality control measures must be taken during the envelope installation by the GC to ensure air tightness. Caulking and expanding aerosol products should also be used to seal all gaps, and air tightness testing should be performed to confirm the reductions in the building.

DOMESTIC HOT WATER

Lower Flow Fixtures

Lower flow water fixtures have negligible incremental capital costs and they can reduce the domestic hot water loads. In order to meet TGS v3 Tier 1 targets, low flow water fixtures (1.0gpm lavatory faucets; 1.75gpm showerheads and kitchen sinks) were implemented in the development to help saving 28% in water consumption. However, in order to meet Tier 2 and 3 standards, ultra-low flow fixtures (0.5gpm lavatory faucets; and 1.5gpm showerheads and kitchen sinks) that help saving 42% in water consumption were in incorporated.

Drain Water Heat Recovery

Waste water heat recovery units can be used to extract energy from wastewater to supplement heating loads. As wastewater exits the building, it can be used to preheat water before entering the boiler, without contaminating or mixing with the clean water. Incremental costs are estimated at $500/dwelling unit, and the savings can be estimated using recovery effectiveness of 30%.

However, the low flow fixtures conflict with waste heat recovery, as separating the plumbing makes it more difficult to achieve proper waste flushing. Incorporating waste water heat recovery alongside ultra low flow fixtures can further decrease the total domestic hot water use from a 42% reduction from baseline to a 59.4% reduction.

Air Source Heat Pump Domestic Water Heaters

A 240 MBH air source heat pump was implemented in the domestic hot water loop to achieve the greenhouse gas emissions to meet Tier 3 requirements. Applying this ECM will significantly reduce greenhouse gas emissions, as one of the largest end-use of emissions is typically domestic hot water consumption. With air source heat pump technology, a backup system is typically required. It gradually loses its heating capacity below 25°F (-3.9 °C) till it can no longer operate at 10°F (-12.2 °C).

Electric Domestic Water Heaters

Electric domestic water heaters can be implemented as an alternative to Natural Gas (NG) water heaters. This implementation as an energy conservation measure to achieve greater reduction in greenhouse gas emissions.

VENTILATION

Ventilation Energy Recovery

Energy Recovery Ventilators (ERVs) provide fresh air to meet building code requirements while recovering energy from exhaust air exiting the space. The industry standard system for residential projects is an integrated fan coil ERV unit (ERV and fan coil packaged together) at 70% efficient heat recovery. ERVs were implemented in the building model in all suites and amenities to meet Tier 1 and 2 requirements, and higher efficiency ERVs (85%) were implemented to meet Tier 3 requirements.

Corridor Pressurization and Stack Effect

The common industry standard is to maintain air flow in residential hallways at 30-40 cfm per suite door. This helps prevent stack effect (aggressive heat and air migration up the building in winter) and odour transmission between suites. To allow for this conservation measure it is recommended to weather-strip suite doors to prevent leakage from the corridors that may depressurize the space. Additionally, doors to exit stairs should be sealed to prevent air leakage up the building, and additional elevator lobby doors could be considered on residential floors to prevent ventilation leakage through the elevator shaft. Corridor pressurization has been modelled at 40 cfm per suite door to meet Tier 1, 30 cfm per door for Tier 2, and 12 cfm per door for Tier 3 standards. The model also includes a summer and night time 50% airflow setback for the corridor fresh air system, greatly decreasing energy consumption.

HIGH EFFICIENCY EQUIPMENT AND APPLIANCES

Lighting

Lighting typically contributes 10-15% of a building's overall electricity consumption, and therefore an important factor in reducing energy consumption. The internal lighting loads for this development have been determined based on ASHRAE 90.1 standard uses. Lighting loads should be reduced by 15% from the typical values in order to meet Tier 1 and 2 standards, and 40% to meet Tier 3.

LEDs are the most efficient form of lighting, 90% more efficient than incandescent and 50-60% more efficient than fluorescent. There have been significant improvements in LED lighting technology, and concerns regarding harsh colouring or high capital costs are no longer major concerns. LED lighting would be the most efficient fixture type for this project, and would help meet the targeted lighting reductions. Reducing the lighting load by 40% will be difficult to achieve, therefore occupancy sensors and light simulation optimization must be considered.

Greenhouse Gas Reduction Measures

Greenhouse gas reduction measures were determined by first examining where the proposed building design loads could be reduced. The following items provide the most opportunity for load reduction:

- Low carbon heating and cooling systems
- District energy System
- On-site solar PV electricity production
- Micro-grid

LOW CARBON HEATING AND COOLING SYSTEMS

Air Source Heat Pump (ASHP)

An air source heat pump can inject heat to a typical fan coil heating loop or domestic water system without burning local carbon emissions. This plant level modification will have a significant impact on all the required TGS energy metrics, and will allow for looser energy performance elsewhere in the building. Typical air source heat pumps do not operate well below 15F and therefore a full boiler system sized for peak loads would still be required. Air source heat pumps have been modelled as part of the central hot water system to meet Tier 2, and 3, with a full-sized boiler system modelled to meet load demand when the outdoor air temperature drops below 10F. Tier 2 required a 750 MBH ASHP, while Tier 3 required a 1500 MBH ASHP.

Ground Source Heat Pumps (Geothermal)

Ground source heat pumps use the mass of the earth to improve the performance of vapor compression refrigeration cycle which can heat in winter and cool in summer. Glycol is passed through vertical or horizontal piping loops between the building and the ground. The fluid absorbs heat from the ground in the winter months and rejects heat to the ground in the summer months. The soil remains at a relatively constant temperatures and essentially serves as a highly efficient heat rejection medium.

Since this would be below the below grade building levels, the construction of the geothermal field would need to be coordinated with the overall building construction plan and may extend the construction schedule.

Integrating geothermal into the building is typically done in two ways. The heat can be transferred with a water-to-water heat pump (centralized system) or multiple water-to-air heat pumps (distributed system). Multi-unit residential buildings utilize distributed heat pump systems as typically the mechanical designs are already distributed systems i.e. fan coils.

It is important to note that ground source heat pumps shift the primary source of heating energy from natural gas to electricity. The discrepancy between the cost of electricity and the cost of natural gas results in a balancing act between energy savings and energy cost savings. The current average electricity cost is ~0.16/kWh, whereas the average natural gas costs is $0.48/m3. Therefore, energy cost savings will be far less significant than energy savings when compared to a natural gas heated reference building.

The incremental geothermal system capital costs and discrepancy in utility costs due to switching from natural gas to electric heating make it imperative that the base building heating and cooling loads are reduced as much as possible. There is potential to see cost benefits associated with ground source heat pumps when the overall building loads have been reduced first.

There is no cost benefit to ground source heat pumps as an individual measure; however, combined with decreased glazing area, improved glazing performance, as well as solar strategies that reduce the ventilation and domestic water heating load, ground source heat pumps play a key role in achieving lower energy use intensities.

DISTRICT HEATING AND COOLING

Greenhouse gas emissions can be further reduced by connecting to a district energy system. These systems generate or extract heat at a central plant, which is then distributed to surrounding buildings via underground pipes. These systems provide higher efficiencies and lower emissions than individual heat sources.

Typical local district energy systems come in the form of smaller well managed plants which can have typical plant equipment or have more sustainable heating systems

With a geothermal system most of the capital cost associated with geothermal vertical field is covered by the district energy system provider. In return the district energy system (DES) provider will provide a cost per capacity and per consumption for the geothermal system. The future resident will pay a portion of the energy bill to the DES developer and at the end of the 30 year cycle the condo corporation or rental tower owner will own and maintain the geothermal system.

Alternatively, wastewater heat pumps could also be implemented to electrify the heating of the building. A DES developer would review city waste sewer lines to determine the heating capacity available. Government approvals through multiple authorities would need to be sought after. The wastewater heat pumps would perform significantly better than geothermal heat pumps. The supply temperature range is typically between 68°F – 72°F (20°-22°C). The maintenance and operation would be also completed by the DES developer.

COMBINED HEAT & POWER

Combined heat and power systems (CHP) are on site electricity production systems that are specifically designed to recover waste heat from the electricity production process for the use in heating, cooling, or process applications. A properly designed CHP plant can be twice as efficient as a typical fossil fuel power plant, converting up to 80% of the energy from input fuel into electricity and useful heat.

The most successful applications for CHP involve projects where the demands for electricity and heat align. Projects with central heating and cooling plants such as university campuses, provide a good match for CHP systems because an infrastructure for distributing the heating and cooling already exist and there is generally a continuous or large demand for simultaneous electricity and heat. When electricity and heating demands are not in synchronization, the efficiency and feasibility of a CHP is reduced. Increasing the carbon emission associated with CHP design for this application will significantly reduces the chance to meet TGS v3 targets and therefore not recommended for this project.

SOLAR PV ELECTRICITY PRODUCTION

Photovoltaic (PV) cells capture sunlight to generate electricity. PV cells, or solar cells, are arranged together in a module to collect sunlight and convert it into usable electricity. The electricity can be used as a partial or complete supply for a building’s electricity needs. Excess electricity can be relayed back to the electricity grid or stored in batteries. Larger area modules with the same efficiency will produce more electricity. PV cells are most efficient in direct sunlight and lose efficiency with shading, dirty surfaces, and heating of the cells. Therefore, the location and orientation of the panels affects their output.

A solar PV system requires a great deal of roof space in order to be considered a viable option. Given the low ratio of roof to total floor area of this development, PV cells would not be able to provide enough electricity to the building and therefore have not been incorporated into the model.

Results Summary Energy Conservation Measures

TORONTO GREEN STANDARD TIER 1

- Window to wall ratio (WWR) 40%
- Wall R-Value R-6.5, assuming balconies in every suite
- Typical window wall assembly - (spandrel with semi-rigid insulation in the cavity and back-pan insulation)
- Window U-Value - 0.365 Btu/h sf °F
- Insulated Floor (Parking & Level 1) effective R-20
- Install Demand Control Ventilation (DCV) in commercial spaces and amenities
- Corridor Ventilation of 40 cfm/suite with a 50% nighttime and summer time set-back schedule
- Reduce Lighting Power Densities (LPD) 15% below 2017 Ontario Building Code SB-10 requirements value
- In-suite ventilation energy recovery provided for dwelling units: 70% sensible and 60% latent effectiveness
- Multi-speed boiler/chiller fan coil system
- Ultra-Low flow water fixtures: 1.0gpm lavatories and 1.75gpm kitchen sinks and showerheads

TORONTO GREEN STANDARD TIER 2

All Tier 1 ECMS are also implemented in the Tier 2 model with the following modifications:

- Wall R-Value R-8
- Corridor Ventilation of 30 cfm/suite with a 50% nighttime and summer time set-back schedule
- A 750 MBH ASHP on the central hot water loop
- Low flow water fixtures: 0.5gpm lavatories and 1.5gpm kitchen sinks and showerheads

TORONTO GREEN STANDARD TIER 3

All Tier 1 and 2 ECMS are also implemented in the Tier 3 model with the following modifications:

- Walls with effective R-10
- Window U-Value - 0.25 Btu/h sf °F
- Corridor ventilation of 12 cfm/suite with a 50% nighttime and summer time set-back schedule
- In-suite ventilation energy recovery provided for dwelling units: 85% sensible and 75% latent effectiveness
- Lighting reduction of 40%
- Fan power load reduction of 20%; optimized fan static reduction layouts, VFDs, and ECM motors
- A 240 MBH ASHP Domestic Water Heater
- A 1500 MBH ASHP Heat Pump on the central hot water loop

Energy Resilience

Standard practice for multi-unit residential buildings is to provide backup power systems that cover all life safety requirements and base buildings loads such as pressurization fans, boilers, sump pumps and domestic hot water systems. Backup power must, at a minimum, provide 72 hours of emergency power for domestic water and elevator service, as well as heating, lighting, and receptacle power to an emergency refuge area, such as a central common area, amenity space or lobby. Diesel generators are more common than natural gas generators since natural gas generators cost approximately double and are larger than their diesel counterparts are.

Additionally, natural gas generators above 350 kW have difficulty meeting the 15-second maximum time allowance for life safety equipment to come back on. Multiple or twin generators could address this concern. The benefits of natural gas generators are lower NO_X emissions as well as a constantly available fuel supply that does not have to be delivered.

The distribution and sizing of the backup systems will need to consider Ministry of Environment and Climate Change requirements for NO_X emissions. Typically, the generators must be located at higher levels such as a penthouse to satisfy the emissions requirements. A typical design for this development would locate a single generator at the top of the building.

Cooling equipment must also be oversized in order to meet the demands of rising temperatures until the year 2050. The current 97.5% percentile cooling design day for Toronto reaches 88°F/73°F (31ºC/23ºC), and Crowther Lab predicts a temperature increase of 43°F (6 ºC) during Toronto’s warmest month of the year by 2050. Therefore, cooling equipment must be designed for 99°F (37ºC) dry bulb temperature.

Low Embodied Carbon

Low embodied carbon analysis will be provided as a separate report to fulfill Zoning Bylaw Amendment application requirements. Material Emissions Assessment for the structure and envelope is performed in accordance with the Canada Green Building Council (CaGBC) Zero Carbon Building Standard v2 methodology for the Upfront Carbon lifecycle stage (A1-5). This analysis Identifies low-carbon sustainable material alternatives to the proposed structure or envelope for use in the building project.

Recommendations

During this analysis, several energy strategies were explored in order to help the proposed building design to achieve the compliance with Toronto Green Standards (TGS v3 Tier 1, TGS v3 Tier 2, and TGS v3 Tier 3).

The TGS v3 Tier 1 energy and emission targets can be achieved by using R-6.5 walls, R-30 roofs, 40% WWR, energy efficient windows (0.365 Btu/h sf °F), low water flow fixtures, 15% reduction in lighting and equipment loads, using energy recovery ventilators and efficiently scheduled MUAs. If a geothermal loop is implemented it could provide more flexibility in the design, allowing for a higher window-to-wall ratio, and greater lighting and equipment loads.

The TGS v3 Tier 2 targets are possible to be achieved, but would require the design team to improve the building envelope and design around these targets. in addition to the ECMs needed to reach Tier 1, Tier 2 requirements could be met by using R-8 external walls and 750 MBH ASHP on the central hot water loop. Also, the corridor ventilation was reduced for 40 cfm/suite (applied to meet Tier 1) to 30 cfm/suite.

It would be challenging but not impossible to meet the TGS v3 Tier 3 targets. It would require all the same ECMs as Tier 2, in addition to R-10 external walls, 0.25 Btu/h sf °F windows, a 240 MBH domestic hot water ASHP with electric heaters, a 40% lighting reduction, a corridor ventilation of 12 cfm/suite, more efficient ERVs (85%) and further reduced fan power consumption (20%). Also, the ASHP on the central hot water loop capacity needs to be increased to 1500 MBH

In general, the energy use and emissions for this building can be reduced by using LED lighting and occupancy sensors, low flow fixtures, and energy recovery ventilators. Smart metering should be considered in order to provide a more detailed and accurate reading of the building's overall energy use. Infiltration should be minimized by weather stripping suite doors and sealing exits doors, and can be analyzed using air tightness testing.

For the development to achieve net zero emissions by 2040, all the significant ECMs must be implemented (geothermal and air source heat pump, energy recovery ventilators, R-20+ walls, R-50 roofs, triple glazed windows, 64% domestic hot water reduction, 75% lighting reduction). The building must also fully decarbonize the on-site heating and domestic water system. Electric or heat pump boilers must also be considered to provide 100% of the heating and domestic water system in the future. If the building utilizes geothermal, the heating system will be fully decarbonized other than the emission factor of the electrical grid, which could be balanced out by carbon offsets.

Best Practices

COMMISSIONING

When implemented correctly, a commissioning plan can help establish measurable benchmark standards for all energy related systems and ensures proper construction and installation of electrical and mechanical systems. It ensures equipment meets performance and efficiency specifications and serves as a guideline for all team members involved in a project, defining the objectives, scope, schedule, and responsibilities of each team member.

SMART METERING

Smart meters can be used as an alternative to traditional analog metering to track electricity, gas, and water usage. These devices provide information about usage trends throughout the month rather than only reporting a monthly total, and can provide information about outages and maintenance. The information collected can then be used to analyze and improve existing infrastructure based on demand.

AIR TIGHTNESS TESTING

Air tightness testing can be completed to determine the rate at which air is escaping a building through unseen cracks and holes. Identifying and fixing any issues improves durability, occupant comfort, and mechanical ventilation system effectiveness, lowers utility costs, and enhances resiliency. The test is ideally performed on a building as a whole, but can be completed using sample floors or temporarily partitioned zones.

Appendix A: Energy Modelling TGS Tier 1 Assumptions

MODEL SUMMARY

Project Title	**1365-Yonge Street**
Date	**2023-05-25**
Location	**Toronto**
Software	**eQuest 3.65 7175 DOE 2.3**
Weather File	**CWEC2020\CAN_ON_TORONTO-INTL-A_6158731_CWEC2020.bin**

BUILDING SUMMARY

Project Size	**Total GFA** 45,919 sqm
Total Number of Residential Units	**655**

OPAQUE ENVELOPE

	Design	
	Description	**Performance**
Overall Wall	Assumption	R-6.5
Roof/Exposed Floor	Assumption	R-30

GLAZING

	Design	
	Description	**Performance**
U-value (effective)	Preliminary Design Information	0.365
SHGC		0.33
Window-to-Wall Ratio		40%

INTERIOR LIGHTING

	Design	
	Description/Controls	LPD (W/sf)
Lobby	Targets per SB-10 2017	0.9
Amenity		0.77
Corridor		0.78
Dwelling Unit		0.47
Retail		1.68
Locker		0.57
Mechanical / Electrical		0.91
Parking Garage		0.17
Stairs		0.69
Office		0.79
Conference / meeting / multi-purpose		0.82
Storage		0.52

ELECTRICAL

	Design	
Load	Description	Power or Power Density
Amenity & Lobby	ASHRAE default per space type	0.0003 kW/sf
Dwelling Unit	Energy Star® appliances	0.47 W/sf
Miscellaneous Fans and Booster Pumps	Preliminary estimate Total power de rated for varying schedules	24.34 kW
Elevator		33.30 kW

WATER-SIDE

	Design Description Performance
Chill Water	Electric Hermetic Centrifugal Chiller COP 6.0 Variable Speed Compressors Set points (Supply/Return): 44°F / 54°F
Hot Water	Natural Gas Condensing Boilers, 95% thermal efficiency rated Supply/Return Temperature: 130°F / 100°F
Condenser	Cooling Towers, Efficiencies per ASHRAE 90.1-2013 + VFDs Set points (Supply/Return): 85 / 95°F
Domestic Hot Water	Natural Gas Condensing Water Heaters, 95% thermal efficiency Supply Temperature: 140°F Modelled Peak – Low flow fixtures Lavatories 1.0gpm | Showers 1.75gpm | Kitchen sink 1.75gpm

AIR-SIDE HVAC

	Design Description Performance
MUAs - Residential Corridors, main lobby and amenities	DOAS Supplying tempered ventilation air at 40 cfm per suite to corridors and lobbies Supply Fan W/cfm: 0.9 with Variable Speed Fan Hydronic Heating & Cooling Coils MUA 50% nighttime and summer time set-back schedule
Suite Fan Coil Units with ERV	Ventilation Provided in accordance with ASHRAE 62.1-2010 directly to suite via ERV 1 bedroom 50 cfm | 2 bedroom 75 cfm | 3 bedroom 100 cfm ERV Performance Energy Recovery: 70% Sensible, 60% latent effectiveness Fans: 0.0006 kW/cfm Fan Coil Performance Fans: Constant volume at 0.00016 kW/cfm

	Exhaust Fans: Washroom: 65 Watts Kitchen Hood: 82 Watts Dryer: 80 Watts
Amenity Spaces	Ventilation Provided in accordance with ASHRAE 62.1 ERV Performance Energy Recovery: 70% Sensible, 60% latent effectiveness Fans: ECM motors, 0.3 W/cfm Fan coil Performance Fans: Variable speed with ECM motors average at 0.0003 kW/cfm
Heating Only Spaces Hot Water Force Flow Heaters	Fans: Constant volume 60 °F Heating Set point