12100 Creditview Road Buildings A and C1/C2

Energy Modelling Report & Solar Feasibility Study

12100 Creditview Road, Caledon, Ontario

Prepared for: Fieldgate Developments (12100 Creditview Developments)

Project No.: PR-24-192

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Pratus Group

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Pratus

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Issuance Approval

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Michael Paz	Christopher Mohabir	Eric Dunford

Document Revision History

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Limitations

This report has been prepared by Pratus Group with the purpose of summarizing the TGS compliance study conducted for Fieldgate Developments for the property at 12100 Creditview Road, Caledon, Ontario under the terms of our agreement. The material herein reflects Pratus Group's best judgement in light of the information available to them at the time of preparation. Any use that a third party makes regarding the information provided within this report including reliance on, or decisions to be made based on it, are the responsibility of such parties. Pratus Group accepts no responsibility for damages, if any, suffered by any party as a result of decisions made or actions taken based on this report.

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1. Executive Summary

Pratus Group conducted two analyses for the proposed development located at 12100 Creditview Road in Caledon, Ontario in conformance with the Town of Caledon Green Development Standard (GDS). The analyses conducted included:

- Development of an Energy Modelling Report consistent with the requirements of GDS **Metric 3.1: Operational Energy and GHG Emissions**
- Development of a Solar Feasibility Study consistent with the requirements of GDS **Metric 3.3: Solar Readiness**

The proposed development is a commercial retail complex 35.93 acres in size. It is proposed to include three clusters of retail buildings (referred to as Buildings A, B, and C) consisting of a total building footprint of 28,046 m^2 and 1,631 at-grade parking spaces per the most recent site plan documentation available.

1.1 Energy Modelling Report Summary

Per Metric 3.1: Operational Energy and GHG Emissions of the GDS, all new buildings greater than 2,000 m^2 in size are required to complete and submit an Energy Modelling Report consistent with the Town's Terms of Reference and Guidelines. This includes prescribed targets for greenhouse gas emissions intensity (GHGI), thermal energy demand intensity (TEDI), and total energy use intensity (TEUI). To meet the requirements of Metric 3.1, Pratus Group developed a Design Development Stage Energy Report consistent with the requirements of the GDS using the IES Virtual Environment energy modelling software. This report summarizes the results of this analysis.

There are two buildings located at the proposed development site that meet or exceed the minimum size defined by the GDS where an Energy Modelling Report is required (Buildings A and C1+C2). The proposed buildings are both 1-storey commercial retail buildings. The floor area is expected to consist primarily of retail floor space, entry vestibules, and loading areas. All other components of the proposed retail development were excluded from the analyses conducted as they do not meet the minimum size specified by the GDS for Metric 3.1.

Energy conservation measures were evaluated for feasibility for the buildings to reduce energy demand and promote emissions reduction in line with the GDS prescribed targets. The following are the key building performance features proposed to enable the buildings to meet the prescribed energy performance targets:

1. Use of high-efficiency natural gas/DX rooftop units serving the retail spaces with heating efficiencies of 80% E_t and cooling efficiencies of ~COP 3.5
2. High performance exterior wall, meeting R-25 (cladding system effective R value)
3. High performance roof meeting R-30
4. Use of energy recovery ventilation for retail spaces that can achieve 65% sensible effectiveness and 55% latent effectiveness

These measures represent a change to the base design provided by the building developer. Pratus Group has identified these measures as minimum requirements to achieving the prescribed GDS energy targets to the project architect. Collaboration with the project architect will continue through the design process to ensure that all measures required to achieve the energy performance targets are successfully integrated into the design.

While the other buildings within the proposed development were not required to be modelled per the GDS, the proposed building designs are consistent with those that were modelled and it is recommended that the proposed energy conservation measures be similarly implemented for these buildings. These measures will contribute to site-wide emissions reduction consistent with the objectives set out in the Town's GDS and offer utility cost savings.

Building A Results

Based on the incorporation of the energy conservation measures identified above, the proposed building design is expected to achieve a TEUI of **100.3** kWh/m^2, a TEDI of **6.2** kWh/m^2 and GHGI of **4.2** kg CO_2/m^2. These modelled values are all below the maximum allowable thresholds established by the GDS for Commercial Retail buildings. Building A is therefore in conformance with the requirements of GDS Metric 3.1.

Building C1/C2 Results

Based on the incorporation of the energy conservation measures identified above, the proposed design is expected to achieve a TEUI of **117.4** kWh/m2, a TEDI of **18.5** kWh/m^2 and GHGI of **7.0** kg CO_2/m^2. These modelled values are all below the maximum allowable thresholds established by the GDS for Commercial Retail buildings. Building A is therefore in conformance with the requirements of GDS Metric 3.1.

1.2 Solar Readiness Summary

Per Metric 3.3: Solar Readiness, buildings with a rooftop area >50,000 ft^2 must conduct a feasibility assessment for the installation of a solar PV system. The system may consist of rooftop mounted, ground, cladding, or similar solar PV systems. The objective established by the GDS is for 30% of annual electricity demand for the building to be met through the solar PV system.

There same two buildings located at the proposed development site meet or exceed the minimum roof size where a solar feasibility study is required. Note that the roof area of buildings C1 and C2 were considered to be conjoined for the purposes of the analysis conducted.

Analysis of solar feasibility was conducted using integrated PV Panel analysis tool within the IES-VE software. The results of the analysis demonstrate that there is sufficient space available on the roof of both buildings to support a solar PV array that would meet the targeted energy generation requirement established by the GDS.

The initial feasibility analysis will need to be validated further by structural, mechanical, and electrical engineers to evaluate load requirements and to determine the design and location of conduits, HVAC systems, and/or roof equipment. Successful deployment of a solar PV system will also require collaboration between the property developer and prospective building tenants to confirm acceptance of the installation of a solar PV system.

2. Project Background

The proposed development is a commercial retail complex that is 35.93 acres in size located at 12100 Creditview Road in Caledon, Ontario. It is proposed to include three clusters of retail buildings (grouped as buildings A, B, and C) consisting of a total building footprint of 28,046 m^2 and 1,631 at-grade parking spaces. Two of the buildings, Building A and Building C1/C2 exceed 2,000 m^2 and are therefore subject to the requirements of the GDS to produce an Energy Model Report.

The proposed buildings consist of 1-storey commercial retail space. The building floor area is primarily retail space, with minor space dedicated to an entry vestibule, and a loading area.

The retail spaces in the building are expected to be heated and cooled via packaged roof top units with gas-fired heating and DX cooling. The outdoor air for the retail spaces is to be provided via energy recovery ventilators. Gas-fired unit heaters will provide heating to the entry vestibules and loading areas. The domestic hot water (DHW) heating is expected to be serviced by electric hot water boilers.

The 3D rendering of Building A is shown in the **Figure 1** below, and the rendering of Building C1/C2 is shown in **Figure 2**.

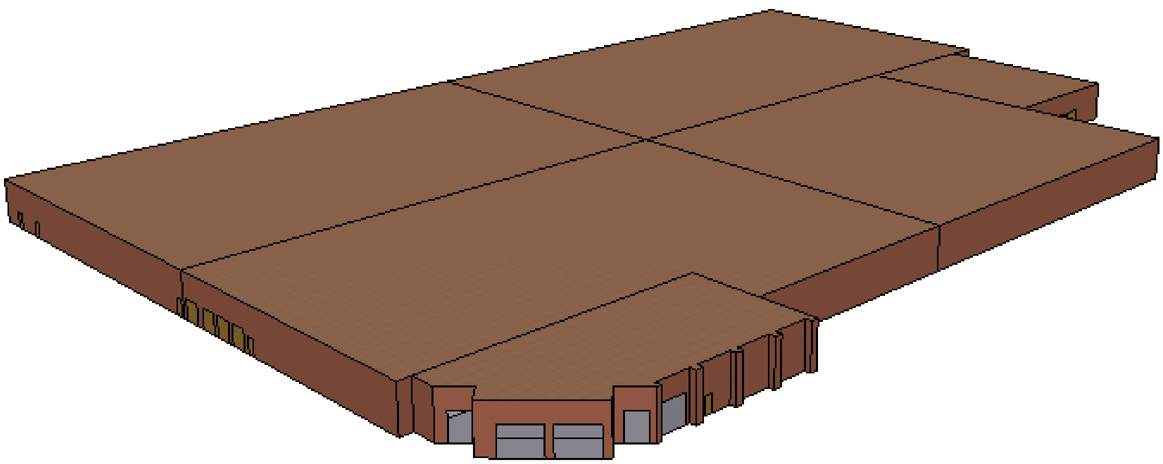

Figure 1: 3D Rendering of Building A in IES-VE Software

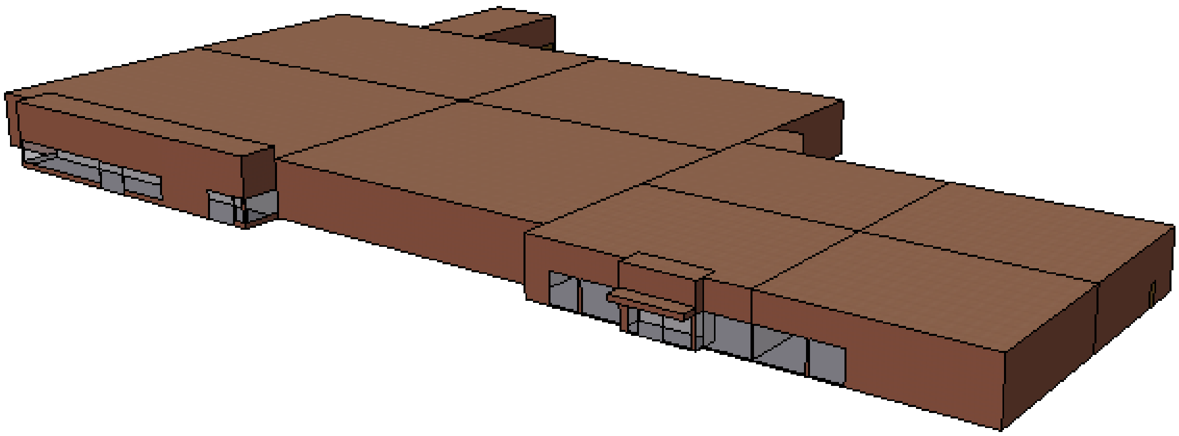

Figure 2: 3D Rendering of Building C1/C2 in IES-VE Software

3. Project Goals

This report summarizes the results of the Design Development Stage Energy Report prepared to demonstrate compliance with the GDS requirements for Site Plan Approval. Per **Metric 3.1: Operational Energy and GHG Emissions** of the GDS, institutional and commercial buildings are required to demonstrate performance at or below the prescribed performance targets summarized in **Table 1.**

Table 1: Town of Caledon GDS Performance Targets by Metric

Performance Metric	Prescribed Target
Greenhouse Gas Emissions Intensity (GHGI)	10 kg $CO_2e/m^2/yr$
Thermal Energy Demand Intensity (TEDI)	30 $kWh/m^2/yr$
Total Energy Use Intensity (TEUI)	130 $kWh/m^2/yr$

The rendering of the energy model with a solar arc for Building A can be observed in **Figure 3** below.

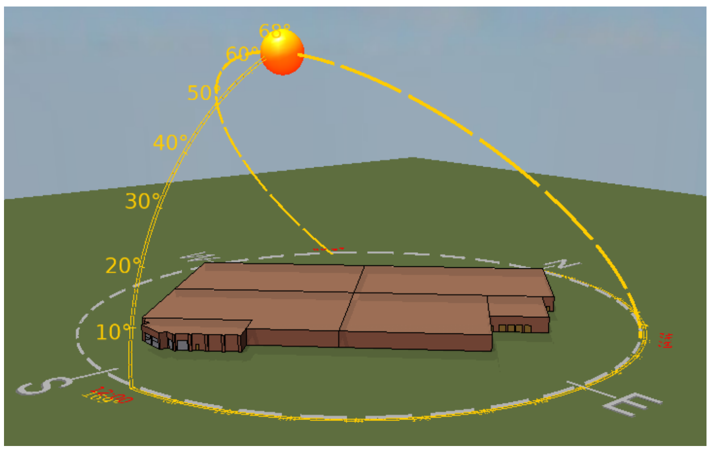

Figure 3: Rendering of Energy Model with Solar Arc, Building A

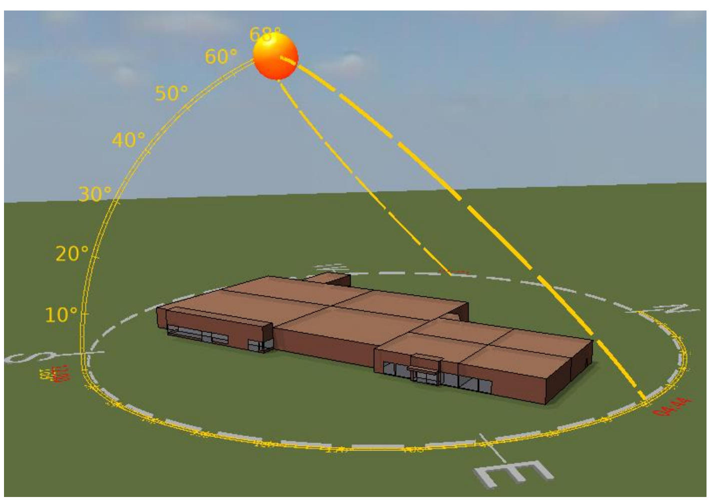

Figure 4: Rendering of Energy Model with Solar Arc, Building C1/C2

4. Energy Modelling Methodology

The project was analyzed and simulated using IES Virtual Environment 2024 building performance simulation software. IES-VE is a premium building energy simulation software that enables simulation of complex building systems including solar shading, daylighting, natural ventilation, and highly customizable HVAC systems. This software is one of the listed acceptable software options identified within the GDS.

Modeling was carried out in accordance with the Town of Caledon GDS requirements, which references the TGS Energy Efficiency Report Submission & Modelling Guidelines for TGS v4, dated May 2022. The energy models were prepared based on architectural drawing sets prepared by Turner Fleischer Architects dated September 11th, 2024. Mechanical and Electrical assumptions were provided by Pratus Group based on experience with similar developments and information provided by the project developer. Details of the modelling conducted are presented in **Appendix A**.

The definitions of various terminologies used in the report is discussed below:

TEUI: Energy Use Intensity (kWh/m²/yr). This is the total annual energy use of the building and site divided by the modeled floor area.

TEDI: Thermal Energy Demand Intensity (kWh/m²/yr). The annual heating load that the mechanical systems must provide to the building for space and ventilation heating, divided by the modeled floor area. Note that this is heat that the systems must provide at the terminals, not energy consumed by mechanical equipment to supply the required heating.

GHGI: Greenhouse Gas Intensity (kg/m²/yr). The annual CO_2 equivalent emissions per modeled floor area using utility rate emissions factors.

5. Energy Modelling Results

Detailed energy modeling inputs that were used as the basis of conducting the analysis in IES Virtual Environment are provided in **Appendix A** for reference.

5.1 Building A

As shown in **Figure 4** the proposed Building A design achieves a TEUI of **100.3 kWh/m²**, a TEDI of **6.2 kWh/m²** and GHGI of **4.2 kg CO_2/m²**. These values are below the maximum allowable thresholds for compliance under the Town of Caledon's GDS, and therefore the proposed building design is compliant with the GDS requirements.

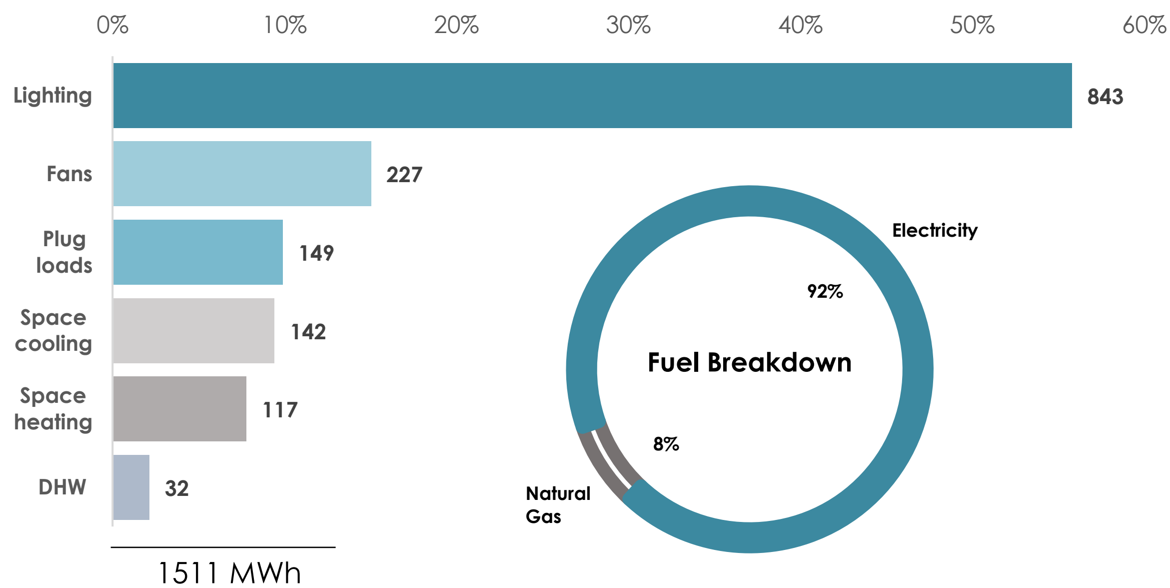

Figure 4: Modelled Energy Breakdown of Building A

5.2 Building C1/C2

As shown in **Figure 5** the proposed Building C1/C2 design achieves a TEUI of **117.4 kWh/m²**, a TEDI of **18.5 kWh/m²** and GHGI of **7.0 kg CO_2/m²**. These values are below the maximum allowable thresholds for Town of Caledon's GDS compliance. These values are below the maximum allowable thresholds for compliance under the Town of Caledon's GDS, and therefore the proposed building design is compliant with the GDS requirements.

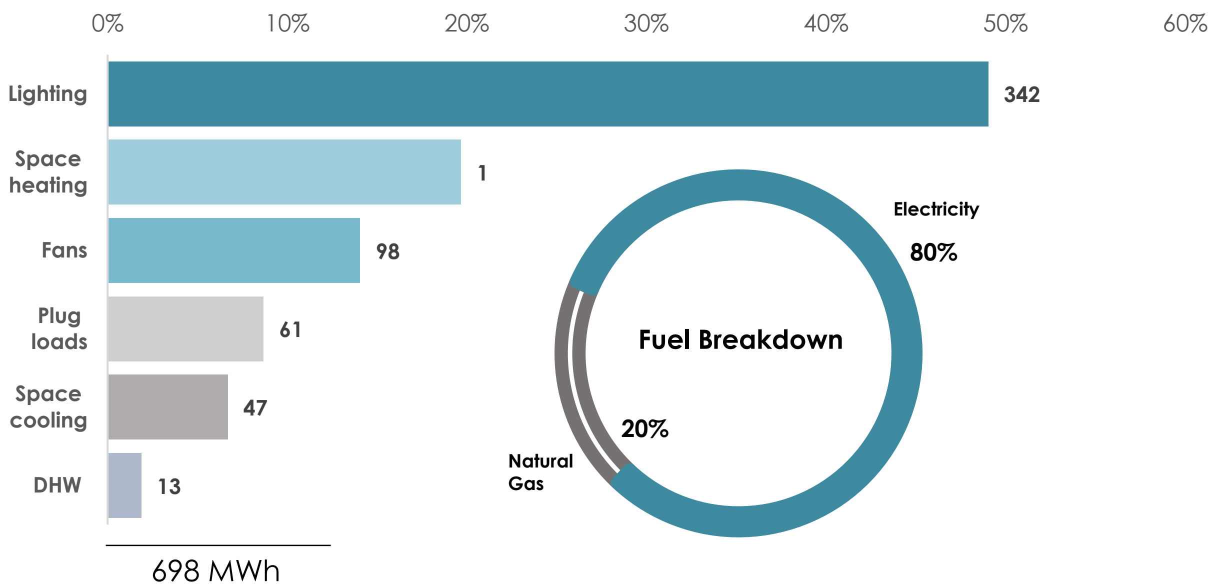

Figure 5: Modelled Energy Breakdown of Building C1/C2

6. Solar PV Feasibility

GDS **Metric 3.3: Solar Readiness** requires the completion of a solar photovoltaic (PV) study for all buildings with a roof area greater than 50,000 ft^2. A solar PV feasibility study assesses the viability and potential benefits of implementing a solar energy system on the proposed site.

The feasibility of a PV system is strongly influenced by:

- The availability of suitable surface area for a solar array to be installed
- Access to solar energy resources (e.g., direct sunlight)
- Distance to electricity transmission lines, and
- Distance to major roadways.

The GDS requires completion of the solar PV feasibility study by a qualified solar provider or energy professional with coordination with structural, electrical and mechanical project consultants. The system under consideration should be appropriately sized based on the building's function, return on investment potential, and local generation capacity.

For this analysis, the major focus is the minimum PV array area required for the system to meet at least 30% of the building's energy requirements as specified by the GDS in Metric 3.3. Analysis of solar feasibility was conducted using integrated PV Panel analysis tool within the IES-VE software. The software was used to determine the PV panel area required to support a system capable of providing 30% of the building's energy requirements. Both rooftop PV panels (applicable for solar canopy installation) and building integrated PV (BIPV) systems were assessed for this study. These systems are further discussed here:

6.1 Rooftop Mounted PV and Canopy Systems

This system consists of solar panels located on rooftop surfaces to minimize shading and optimize sun exposure. Panels may be mounted in different configurations with the most common option being tilted racks. In practice, a maximum of 50% of the rooftop surface area is typically available for the solar array. The remaining 50% of roof space is generally assumed to account for space allocated to mechanical and electrical equipment as well as spacing between racking systems. Building A has a total roof area of 162,218 ft^2 and an available array area of 81,109 ft^2. Building C1/C2 has a combined roof area of 64,000 ft^2 and an available array area of 32,000 ft^2.

Canopy PV systems are a type of integrated PV design that is built into a canopy structure used to provide shading for parked cars while simultaneously harnessing solar energy on the sun exposed surface. Canopy systems effectively serve as an analogue to rooftop space and perform similarly, with constructed canopies in site areas where rooftop space is unavailable or unattractive. The proposed site includes a significant area of surface parking central to the proposed buildings where canopy-mounted systems could be installed. The site parking area was estimated to be approximately 178,088 ft^2 for Building A and 48,958 ft^2 for Building C1/C2.

Should the rooftop system prove undesirable to the property developer or the eventual tenants, a canopy system may provide an alternative option for solar energy generation at the site.

6.2 BIPV

Building-Integrated Photovoltaics (BIPV) refers to solar PV technologies that are integrated directly into building materials, rather than being added on as separate components. These systems enable a building's cladding system to generate electricity without compromising the visual appeal of the building. BIPV systems are typically outperformed by rooftop mounted systems in terms of electricity generation. This is due to the fact that the cladding materials are typically vertical or have less efficient tilt angles for exposure to sunlight. In addition, conventional PV systems have efficiencies ranging from 15%-22%, while BIPV efficiencies typically range from 10%-18%.

From a capital cost perspective, BIPV systems can also cost as much as twice the cost of a conventional rooftop system on a $/Watt basis. For the purposes of this analysis it was assumed that BIPV would be installed solely on south-facing walls to capture the majority of available sunlight. Per the drawings for the proposed buildings on the site, the south-facing walls on both buildings are anticipated to be relatively larger (in terms of surface area) and are also longer than the east and west facing walls. Therefore these walls are best suited for a BIPV system.

6.3 Generation Capacity Analysis

The critical assumptions and inputs for the analysis of the generation capacity of the PV panels modelled include the following:

- PV Panel Type: Monocrystalline Silicon
- Azimuth (angle in degrees clockwise from north): 180 degrees (south orientation)
- Panel Inclination (panel tilt angle in degrees from horizontal): 37.5 degrees (Rooftop/Canopy), 90 degrees (BIPV)

For Building A, the total modelled roof area is 162,218 ft^2 and the following PV panel areas are required to meet at least 30% of the building's annual energy requirements for each PV system type.

Table 2: Building A Required PV Panel Size

PV Type	PV Area Required (ft^2)	Electricity Generation (kWh)
Rooftop PV/Solar Canopy	17,796	453,276
BIPV	27,987	453,276

For Building C1/C2, the total modelled roof area is 64,000 ft^2 and the following PV panel areas are required to meet at least 30% of the building's annual energy requirements for each PV system type.

Table 3: Building C1/C2 Required PV Panel Size

PV Type	PV Area Required (ft^2)	Electricity Generation (kWh)
Rooftop PV/Solar Canopy	8,219	209,329
BIPV	12,925	209,329

The size of the required rooftop PV array to meet at least 30% of the building's annual energy is shown to scale for Building A below in **Figure 6**.

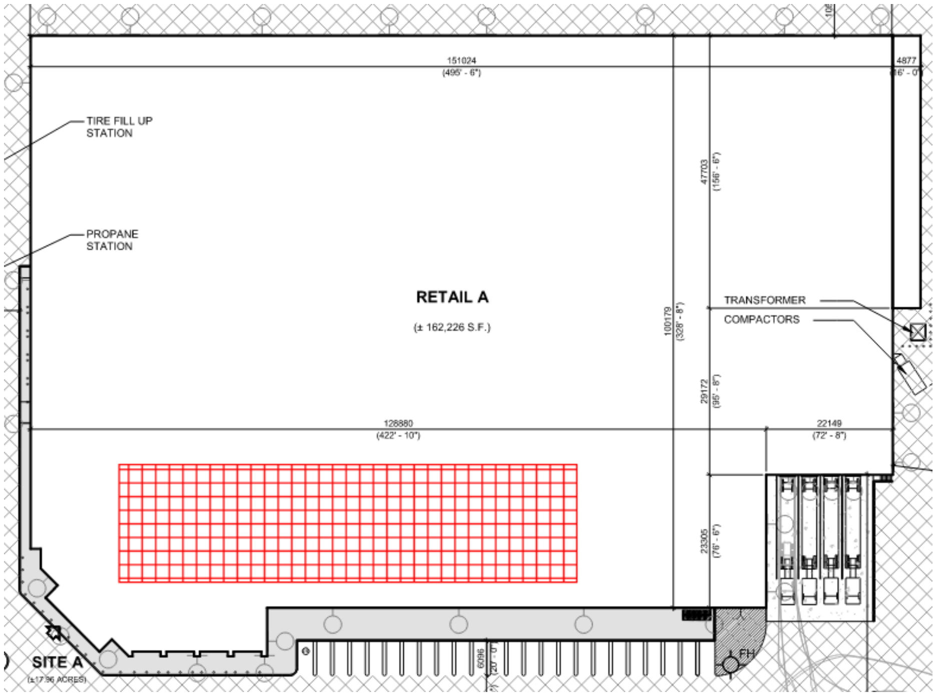

Figure 6: Rooftop PV Array Size - Building A

The size of the required rooftop PV array to meet at least 30% of the building's annual energy is shown to scale for Building C1/C2 below in **Figure 7**.

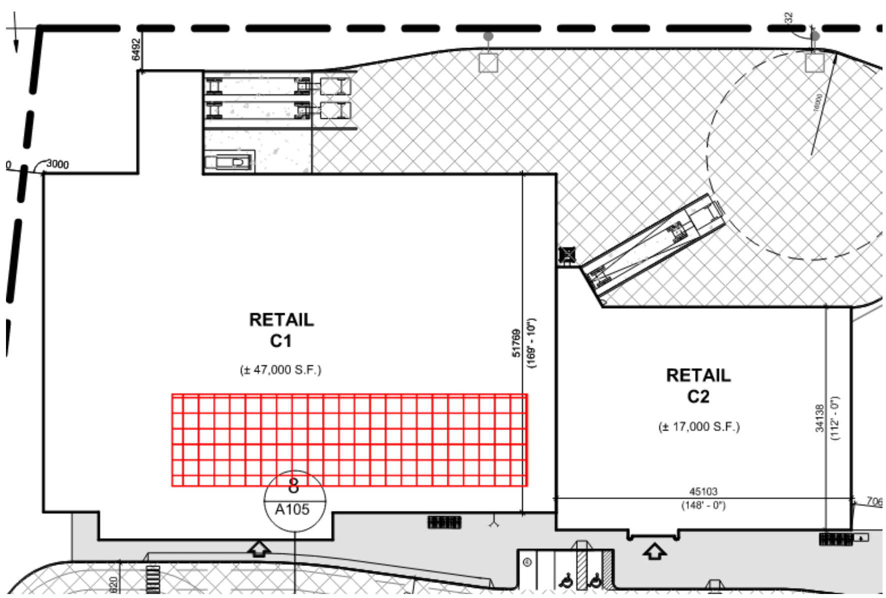

Figure 7: Rooftop PV Array Size for Building C1/C2

Based on standard practice for rooftop PV array systems, 50% of the total building roof area is the maximum space that should be allocated to installation of these systems. The remaining roof area must remain available to support racking clearances and associated mechanical/electrical equipment on the roof. Based on this assumption, both buildings have sufficient roof space to support roof-mounted solar PV arrays to meet the 30% energy generation requirement of the GDS. **Table 4** reports the theoretical maximum rooftop PV array size (based on the utilization of 50% of the available roof space) along with the corresponding maximum electricity generation potential for each building.

Table 4: Maximum Rooftop PV Area per Building

Building	PV Type	Maximum PV Area Available (ft²)	Electricity Generation Potential (kWh)
Building A	Rooftop PV	81,109	1,313,629
	Parking Canopy	178,088	2,884,286
	BIPV	7,967	129,033
Building C1/C2	Rooftop PV	32,000	518,267
	Parking Canopy	48,958	792,916
	BIPV	5,540	89,724

6.4 Feasibility

Rooftop Generation:

- **Building A:** As shown in **Table 4**, the roof surface area required for a rooftop solar system exceeds the required space for solar energy generation established by the GDS. For Building A, 17,796 ft² was estimated to be required, whereas there is approximately 81,109 ft² roof space for Building A available
- **Building C1/C2:** Similarly, for Building C1/C2, the required rooftop space was estimated as 8,219 ft² and there is a total of 32,000 ft² of roof space available for Building C1/C2.

Canopy Generation:

- **Building A:** As shown in **Table 4**, the site parking area required for a canopy solar system exceeds the required space for solar energy generation established by the GDS. For Building A, 17,796 ft² was estimated to be required, whereas there is approximately 178,088 ft² parking space for Building A available
- **Building C1/C2:** Similarly, for Building C1/C2, the required canopy space was estimated as 8,219 ft² and there is a total of 48,958 ft² of parking space available for Building C1/C2.

BIPV Generation:

- **Building A:** The total available south facing wall area is 7,967 ft². The size requirement to meet the 30% target for electricity consumption was modelled at 27,897 ft². Therefore, BIPV alone would not have sufficient surface area to generate 30% of estimated building energy use.
- **Building C1/C2:** The total available south facing wall area is 5,540 ft². The size requirement to meet the 30% target for electricity consumption was modelled at 12,925 ft². Therefore, BIPV alone would not have sufficient surface area to generate 30% of estimated building energy use.

There is therefore sufficient area both for roof-mounted or canopy-mounted solar PV systems to meet the 30% electricity generation requirement established by the GDS for Buildings A and C1/C2. There is insufficient area for BIPV systems to meet this requirement.

7. Solar PV Readiness

The Town of GDS outlines submission requirements to confirm a new building's solar readiness prior to permit submission. Based on the proposed building design for this site, a flat roof construction requires the submission of a Letter of Commitment signed by a qualified professional (e.g., NABCEP, professional engineer, and/or architect) and the developer/builder confirms all new buildings will be designed for solar readiness. Where applicable, additional documentation of a solar feasibility assessment from a solar provider and the local hydro utility is required.

Prior to the permit submission of the building and roof plans, the corresponding consultants must include the following to confirm the solar readiness of the building design:

- The roof plan must indicate the locations of conduits, HVAC, and/or other rooftop equipment and highlight locations for potential future solar or thermal systems.
- Building plans must demonstrate structural capacity for solar PVs, showing the location designated for future electrical equipment, and
- Be prepared by a qualified professional (e.g., NABCEP, professional engineer, and/or architect).

As the scope of this feasibility study was conducted based on drawings and documentation prepared to support Site Plan application, final details of the proposed buildings and their construction were unavailable at the time this study was prepared. A more detailed analysis is required as the design of the buildings advances to be able to fully assess the solar readiness of the proposed development.

Specific details that were unavailable at the time this report was prepared include:

- Confirmation of prospective building tenants and their willingness to implement solar PV systems as part of the building construction (through roof-mounted or BIPV systems)
- Complete mechanical and electrical design information that would inform the location of conduits, HVAC systems, and/or roof equipment required to install the PV system
- Structural drawings to verify load capacity of the roofing system
- Final roof plans outlining dimensions and slope of roof
- Any revised landscape drawings to identify potential shading by adjacent trees
- Interconnection assessment with input from local utility to discuss approval process for grid connectivity and any infrastructure requirements to enable

Should there be interest by the property developer and the tenant to install solar PV, at the Building Permit stage a more detailed analysis should be carried out by a turnkey solar provider in consultation with the developer and its consultant team. This analysis should address the following elements as part of the technical evaluation and design of the system:

- **Structural Assessment** – Structural engineering consultant should evaluate the roof or installation area to ensure it is designed to support the weight of the solar panels
- **Electrical Capacity** – Electrical engineering consultant should analyze the proposed electrical system to confirm that it can handle the additional load from solar energy generation
- **Energy Consumption Analysis** – An energy modeler and electrical engineer should assess the building's energy usage to determine if any changes are expected from the energy modelling

results presented in this report to determine the appropriate size and type of the selected solar PV system.

- **Permitting and Regulations** – Review of local zoning laws, building codes, and any necessary permits prior to solar PV system installation.
- **Interconnection Requirements** - Review the requirements and any associated costs for connecting the solar system to the local utility grid with the respective local utility provider.
- **Solar PV Mounting** - Assess the different mounting options for each building, including but not limited to the following:
  - Roof Mounting
    - Fixed Roof Mounts: Panels are installed on the roof at a fixed angle, maximizing exposure to sunlight.
    - Ballasted Roof Mounts: Use weights to hold the panels in place, suitable for flat roofs, reducing the need for penetrations.
  - Ground Mounting
    - Fixed Ground Mounts: Panels are mounted at a fixed angle on a support structure.
    - Adjustable Ground Mounts: Allow for seasonal angle adjustments to optimize sun exposure throughout the year.
  - Building-Integrated Photovoltaics (BIPV)
    - Solar panels integrated into building materials, such as windows or facades.
  - Solar Carports (Canopies)
    - Structures that provide shade for vehicles while supporting solar panels. Useful for maximizing space in parking lots.
    - With input from turn-key supplier, the electrical team and solar provider should include preliminary layouts for all PV panels and inverter locations with solar power distribution and integration with the existing and new electrical distribution system.

Additional considerations for the design and implementation of a solar PV system include the following:

1. **Peak Electrical Demand** - It should be noted that the peak electrical demand may occur at a different time than the peak solar output. For example, late afternoon hours are typically when peak electrical demand occurs, but the solar output could be reduced based on usage. To ensure that the solar PV provides the utility shortfall, a battery storage system may be required. Any requirements for battery storage should be incorporated into the final study conducted in partnership with a solar provider.

2. **Net Metering of Solar PV System** – In Ontario the net metering program is established by the provincial Ministry of Energy and is governed by the Regulation *O. Reg. 541/05: Net Metering*[1]. This regulation establishes rules for eligibility, technical requirements, financial calculations, and other administrative procedures for net metering. To be eligible for net metering, the site/building must be generating renewable electricity primarily for its own use. The owner must enter into a net metering agreement with the relevant utility to direct any excess renewable electricity to the electricity grid in exchange for bill credits. It may also be necessary for the owner to apply to the local utility to connect the renewable energy system to the grid and meet any technical or safety requirements.

[1] Province of Ontario: https://www.ontario.ca/laws/regulation/050541

8. Conclusion

As described within this report, the proposed design of Buildings A and C1/C2 located at 12100 Creditview Road were modeled as compliant with the Town of Caledon's GDS absolute performance targets for new Commercial Retail buildings.

The solar feasibility analysis conducted similarly demonstrates that there is sufficient roof capacity for both buildings to meet the 30% generation objective established by the GDS.

We trust the foregoing provides the information required at this time. Please do not hesitate to contact the undersigned with any questions or comments.

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Appendix A-Summary of Model Inputs – Building A

SUMMARY OF KEY INPUT PARAMETERS

General

Building Name & Address	12100 Creditview Road - Building Retail A	
Location	Caledon, Ontario	
Simulation Weather File	CAN_ON_Toronto-Pearson.Intl.AP.716240_CWEC2020v2.epw	
Climate Zone	Zone 6(>4,000 HDD)	
Modeling Software	IESVE 2024 v0.0.0	
Building Area	Modelled Area	15,070 m2
Building Type	Commercial Retail Building	
Schedules	Retail	7 days a week, 98 hours/week (As per NECB 2015 Operating Schedule C)

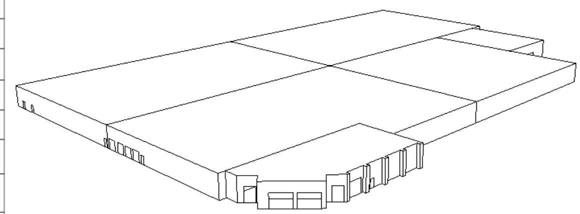
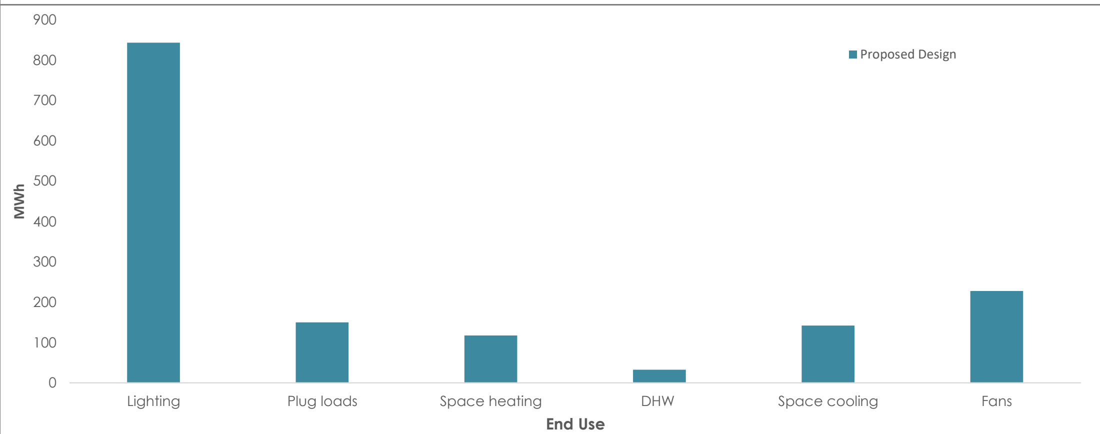


Figure 1: Building Rendering

Overall Building Performance

Energy Use (ekWh)	1,510,919
TEUI	100.3 kWh/m2
Thermal Energy Demand Index (TEDI)	6.2 kWh/m2
Carbon Emissions	4.2 kgCO2/m2

End Use Breakdown



Envelope Performance

Opaque Envelope

	Description	R-IP
Roof	Inverted Roof with Continous Rigid Insulation	R-30
Wall Above grade	Insulated Metal Panel. Target Effective R-15.	R-15
Slab on Grade	Slab on Grade Floor. F-0.510	F-0.510

Fenestration

Glazing	Fixed windows: air filled, double glazed with low-e coating on surface 2	**U-IP**	0.38
		SHGC	0.40
Percentage Glazing	4.6%		
Infiltration	(0.152 cfm/ft2) of total above grade envelope surface area (roofs, exterior walls, and windows, exposed floors), flow varied with windspeed as per PNNL-18898 guideline		

<table>
<tr><th colspan="7">Mechanical Systems</th></tr>
<tr><td rowspan="8">System Description</td><td rowspan="4">Packaged Rooftop Units (RTUs)</td><td>Serving</td><td colspan="4">Retail</td></tr>
<tr><td>Description</td><td colspan="4">Packaged gas-fired heating and DX cooling rooftop units with energy recovery ventilation</td></tr>
<tr><td>Efficiency</td><td colspan="4">Heating Efficiency: 80%
Cooling Efficiency: COP 3.28
ERV effectiveness: 65% sensible, 55% latent</td></tr>
<tr><td>Fan Power</td><td colspan="4">Total OA Flow: 42,995 cfm
Primary Airlow: 177,409 cfm
RTU Fan Power: 1.0 W/cfm</td></tr>
<tr><td rowspan="4">Gas-fired Unit Heaters</td><td>Serving</td><td colspan="4">Loading Area, Entry Vestibule</td></tr>
<tr><td>Description</td><td colspan="4">Gas-fired unit heaters</td></tr>
<tr><td>Efficiency</td><td colspan="4">Heating Efficiency: 80%</td></tr>
<tr><td>Fan Power</td><td colspan="4">Fan Power: 0.3 W/cfm</td></tr>
<tr><td>Fan Control</td><td colspan="6">Ventilation fans run continuously during occupied hours at constant speed. No ventilation provided during unoccupied hours (systems cycle on/off to maintain setback temperatures)</td></tr>
<tr><td rowspan="5">Indoor Design Temperature</td><td colspan="2" rowspan="2">Space Type</td><td colspan="2">Heating (deg. F)</td><td colspan="2">Cooling (deg. F)</td></tr>
<tr><td>Occupied</td><td>Unoccupied</td><td>Occupied</td><td>Unoccupied</td></tr>
<tr><td colspan="2">Retail</td><td>71.6</td><td>64.4</td><td>75.2</td><td>75.2</td></tr>
<tr><td colspan="2">Loading Area</td><td>64.4</td><td>64.4</td><td>NA</td><td>NA</td></tr>
<tr><td colspan="2">Entry Vestibule</td><td>64.4</td><td>64.4</td><td>NA</td><td>NA</td></tr>
<tr><td rowspan="2">Heating/Cooling Supply Air Temperature</td><td>Heating</td><td colspan="5">90°F</td></tr>
<tr><td>Cooling</td><td colspan="5">55°F</td></tr>
<tr><th colspan="7">Central Plant</th></tr>
<tr><td rowspan="4">Domestic Hot Water</td><td>DHW Heater</td><td colspan="5">Electric DHW boilers:100% E_t</td></tr>
<tr><td>Fixture Type</td><td colspan="5">Low-flow fixtures as per below</td></tr>
<tr><td>Lavatory Faucet</td><td colspan="5">1.9 LPM</td></tr>
<tr><td>Kitchen Faucet</td><td colspan="5">5.7 LPM</td></tr>
<tr><th colspan="7">Internal Loads</th></tr>
<tr><td rowspan="4">Lighting Power Density (LPD)</td><td colspan="5">Space Type</td><td>OBC SB-10 Reference LPD W/m^2</td></tr>
<tr><td colspan="5">Retail</td><td>13.1</td></tr>
<tr><td colspan="5">Loading Area</td><td>6.2</td></tr>
<tr><td colspan="5">Entry Vestibule</td><td>7.1</td></tr>
<tr><td>Lighting Controls</td><td colspan="6">Same as ASHRAE 90.1-2013 Table 9.6.1</td></tr>
<tr><td>Lighting Schedule</td><td colspan="6">Corresponding to space type as per NECB.</td></tr>
<tr><td rowspan="2">External Lighting</td><td colspan="2">Demand</td><td colspan="4">2.5 kW</td></tr>
<tr><td colspan="2">Schedule</td><td colspan="4">Photocell control</td></tr>
<tr><td>Process Loads</td><td colspan="2">All Space Types</td><td colspan="4">NECB Defaults for space type</td></tr>
<tr><td>Occupancy</td><td colspan="6">NECB Defaults for space type</td></tr>
</table>

Appendix A-Summary of Model Inputs – Building C1/C2

SUMMARY OF KEY INPUT PARAMETERS

General

Building Name & Address	12100 Creditview Road - Building Retail C1 & C2	
Location	Caledon, Ontario	
Simulation Weather File	CAN_ON_Toronto-Pearson.Intl.AP.716240_CWEC2020v2.epw	
Climate Zone	Zone 6(>4,000 HDD)	
Modeling Software	IESVE 2024 v0.0.0	
Building Area	Modelled Area	5,946 m2
Building Type	Commercial Retail Building	
Schedules	Retail	7 days a week, 98 hours/week (As per NECB 2015 Operating Schedule C)

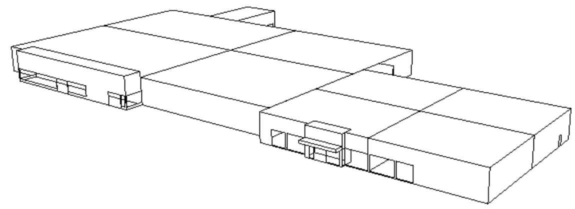
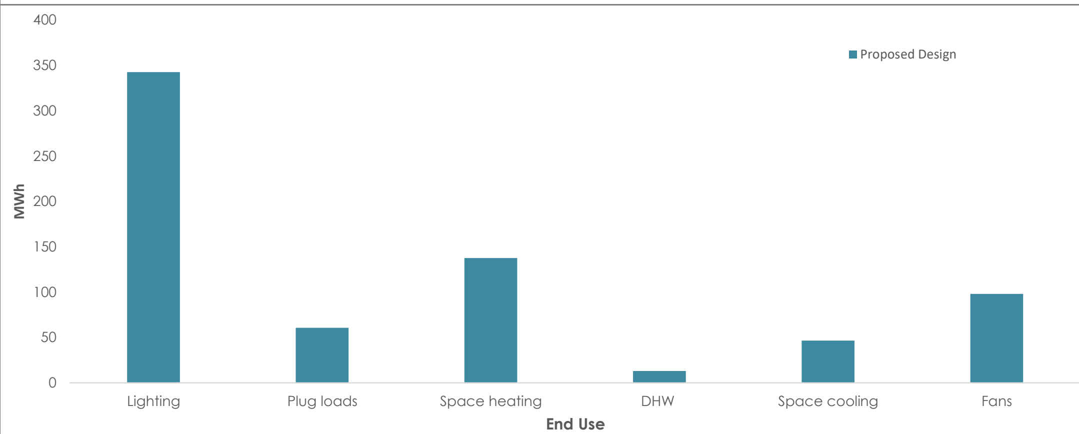


Figure 1: Building Rendering

Overall Building Performance

Energy Use (ekWh)	697,763
TEUI	117.4 kWh/m2
Thermal Energy Demand Index (TEDI)	18.5 kWh/m2
Carbon Emissions	7 kgCO2/m2

End Use Breakdown



Envelope Performance

Opaque Envelope

	Description	R-IP
Roof	Inverted Roof with Continous Rigid Insulation	R-30
Wall Above grade	Insulated Metal Panel. Target Effective R-15.	R-15
Slab on Grade	Slab on Grade Floor. F-0.510	F-0.510

Fenestration

Glazing	Fixed windows: air filled, double glazed with low-e coating on surface 2	**U-IP**	0.38
		SHGC	0.40
Percentage Glazing	8.2%		
Infiltration	(0.152 cfm/ft2) of total above grade envelope surface area (roofs, exterior walls, and windows, exposed floors), flow varied with windspeed as per PNNL-18898 guideline		

Mechanical Systems

System Description	Packaged Rooftop Units (RTUs)	Serving	Retail
		Description	Packaged gas-fired heating and DX cooling rootop units
		Efficiency	**Heating Efficiency:** 80% **Cooling Efficiency:** COP 3.40-3.79 **ERV effectiveness:** 65% sensible, 55% latent
		Fan Power	**Total OA Flow:** 17,430 cfm **Primary Airlow:** 70,014 cfm **RTU Fan Power:** 1.0 W/cfm
	Gas-fired Unit Heaters	Serving	Loading Area, Entry Vestibule
		Description	Gas-fired unit heaters
		Efficiency	**Heating Efficiency:** 80%
		Fan Power	**Fan Power:** 0.3 W/cfm
Fan Control	Ventilation fans run continuously during occupied hours at constant speed. No ventilation provided during unoccupied hours (systems cycle on/off to maintain setback temperatures)		

	Space Type	Heating (deg. F)		Cooling (deg. F)	
		Occupied	Unoccupied	Occupied	Unoccupied
Indoor Design Temperature	Retail	71.6	64.4	75.2	75.2
	Loading Area	64.4	64.4	NA	NA
	Entry Vestibule	64.4	64.4	NA	NA

Heating/Cooling Supply Air Temperature	Heating	90°F
	Cooling	55°F

Central Plant

Domestic Hot Water	DHW Heater	Electric DHW boilers:100% E_t
	Fixture Type	Low-flow fixtures as per below
	Lavatory Faucet	1.9 LPM
	Kitchen Faucet	5.7 LPM

Internal Loads

	Space Type	OBC SB-10 Reference LPD W/m^2
Lighting Power Density (LPD)	Retail	13.1
	Loading Area	6.2
	Entry Vestibule	7.1

Lighting Controls	Same as ASHRAE 90.1-2013 Table 9.6.1	
Lighting Schedule	Corresponding to space type as per NECB.	
External Lighting	Demand	2.5 kW
	Schedule	Photocell control
Process Loads	All Space Types	NECB Defaults for space type
Occupancy	NECB Defaults for space type	