CASE STUDY

YORK MAJOR MEDICAL CENTRE
LEED Gold

1.0 BUILDING FACTS

Building Type:	Medical Office
Location:	Vaughan, Ontario
Gross Floor Area:	Ground Floor: 12,471 ft^2 (1,158.58 m^2) 2nd, 3rd & 4th Floors: 37,413 ft^2 (3,475.74 m^2)
Parking:	214 (18 spaces below grade)
Year Built:	2020
Owner:	York Major Holdings Inc. (YM)
LEED:	LEED Gold

Team:

Developer: York Major Holdings Inc.

Construction Manager: Metrus Construction Ltd.

Property Manager: Metrus Properties Ltd.

Architect: Baldassarra Architects Inc.

LEED Consultant: INVIRO Engineered Systems Ltd.

Energy Modeller: INVIRO Engineered Systems Ltd.

Mechanical Engineer: INVIRO Engineered Systems Ltd.

Structural Engineer: Peter Betka & Associates Ltd.

Electrical Engineer: Manual Jordao & Associates Ltd.

Site Servicing and Grading Engineers: WSP Canada Group Ltd.

Environmental Consultant: Stantec Consulting Ltd.

Landscape Architect: The MBTW Group

2.0 ABOUT

York Major Medical Centre is a high-performance green building that is also a leader in creating a healthy indoor environment for medical practices.

The medical office building is located in the heart of the rapidly growing City of Vaughan, just north of Major Mackenzie Dr., within walking distance of stores, restaurants, business, and high-rise condominiums. Occupants of the building also have neighboring views of the majestic Eagles Nest Golf Course.

York Major (YM), the Owner of this project, set an early goal of developing a building that incorporated sustainable design practices in all aspects with the intent of creating a space that was healthy, highly efficient, and that provided cost-savings. York Major Medical Centre is managed and was constructed by Metrus, acknowledged as a leader in development and property management, with a portfolio of over 15 million square feet of industrial, retail, and office space. As industry leaders, Metrus aims to develop and build sustainably throughout their portfolio with buildings that take the environment and human health into consideration.

With nearly 50,000 square feet (4,645 square metres) of medical office space, York Major Medical Centre boasts one of the largest medical office floor spaces in the central area of Vaughan, leading as a facility that will carry out medical practices in a superior indoor environment for the years to come. York Major Medical Centre took a truly holistic approach to sustainability. INVIRO Engineered Systems Ltd., is pleased to have managed the certification process in attaining LEED Gold.

3.0 Environmental Stewardship

York Major Holdings was committed to designing, constructing and operating a building with a reduced environmental impact by incorporating sustainable initiatives that focus on the areas of:

1. Sustainable Site Practices
2. Responsible Material Selection
3. Waste Reduction
4. Energy Conservation
5. Water Conservation
6. Air Quality

3.1 Sustainable Site Practices

An important decision of this project was the location itself. When deciding where the site would be located, the team sought a dense area that would provide options for alternative transportation and connection with amenities for building occupants, without impacting the land it would be built on.

The medical office is located within a dense area in proximity to a variety of diverse uses, that promotes walkability for building occupants. To reduce pollution from conventionally fueled vehicles, occupants can travel to and from the building using the GO transit rail system as the Maple GO Station is conveniently located within walking distance. The GO transit system provides service with 15-minute, two-way frequency. Additionally, the project incentivizes those with electric vehicles by providing five charging stations just outside of the building.

As a strategy to lessen the environmental impacts of the building, the chosen site located at McNaughton Rd E and Eaglet Ct was previously developed. It is also adjacent to the Keele Valley Landfill Site (KVLS) (1983-2002) which was the largest landfill in Canada. The environmental conditions of the site were assessed through a Phase I and Phase II Environmental Site Assessment (ESA). Soil samples were recovered and tested per the procedures outlined in Ontario Regulation 153/04, where it was determined that results exceeded the site condition standards. The site immediately underwent remediation where contaminated soils were excavated and disposed of off-site to a licensed soil remediation facility. Redeveloping the previously contaminated site mitigated the environmental footprint, allowed for smarter growth and beautified the urban landscape while taking advantage of the existing municipal infrastructure and services.

Figure 1: Site Map

Limiting the environmental impact of the development on the site was further carried out by reducing the effects of light pollution which can have adverse impacts on migratory birds, wildlife species hunting at night, flora and fauna adjusting to seasonal variations, and also disrupts human circadian rhythms. The well thought out lighting design for the building's exterior took uplight, glare and light trespass into consideration. The electrical designer ensured that all exterior lighting fixtures have a downward orientation to create no artificial sky glow and that backlight and glare levels are minimal to reduce the amount of light trespass onto adjacent sites.

Rainwater management practices were implemented on-site to support the key regional features such as wetlands, headwater streams and groundwater aquaifers. Improving on-site infiltration and supplying cool, clean and clear water to these features are essential to support the health of their ecosystems.

3.2 Responsible Material Selection

Understanding the embodied carbon make-up of the building structure and enclosure was very important, as such selecting low-carbon materials was a priority in the early design phases. Additionally, the use of precast concrete hollow core slabs were incorporated into the design to reduce raw material consumption and maintain durability. By performing a Building Life Cycle Analysis (LCA), the team was able to assess the environmental impacts of specific materials and products from extraction through manufacture, use, replace or repair to disposal and recycling. The LCA went beyond just understanding the overall carbon footprint of the building – it assessed environmental impact categories including global warming potential, stratospheric ozone depletion, acidification of land and water sources, eutrophication, formation of tropospheric ozone, and depletion of nonrenewable energy sources. 49.5 weighted products with Environmental Product Declarations (EPDs), disclosing environmental impacts from at least a cradle to gate scope were used.

As an LCA cannot accurately measure all human health, ecological and land-use issues, materials were also selected based on sustainable criteria as an added value to the life cycle approach. The project team worked closely together in selecting 16.6% of materials by cost that were responsibly sourced and extracted. The team identified high-cost materials (such as precast concrete) and ensured that they were extracted, manufactured, and purchased within 160km of the site to reduce the environmental impacts of transportation. To enhance the contributing weight of regionally-sourced materials, material selection was also based on responsible extraction criteria, such as recycled content for various products, take-back programs for carpet tiles, and wood products that were FSC certified throughout their chain-of-custody. The project team also worked in acquiring the chemical contents of materials and selecting those whose manufacturers disclosed ingredients through Health Product Declarations (HPDs), manufacturer inventories, and Declare Labels. 32 weighted products that disclosed green chemistry compositions were used, 5 of which were deemed as "optimized".

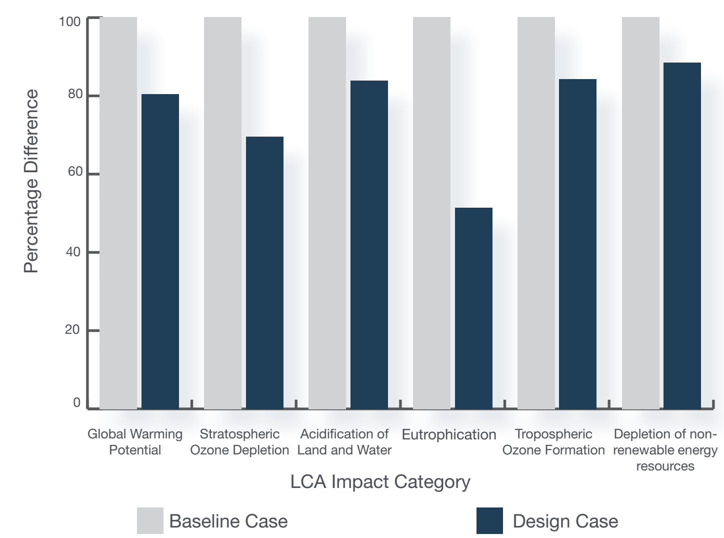

Figure 2: Life-Cycle Analysis (LCA) Results

3.3 Waste Reduction

During construction, a Construction Waste Management Plan was created with the goal of diverting 75% of waste from landfills, with at least five distinct material streams. Bins were kept on-site to allow for source separation to ensure that waste was properly hauled away to various recycling facilities for diversion purposes. Commingled loads were sent to transfer stations where materials were sorted and then hauled away to recycling facilities. Throughout construction, weight tickets were collected to monitor progress in reaching the diversion target.

Waste disposal continues to be a significant environmental burden on communities and ecosystems. Recycling procedures will be carried out post-construction during building operations with an easily accessible recycling area located in the refuse room of the ground floor. The area consists of two, 4 cubic yard bins for recycling and garbage, as well as four 93-gallon carts for general recycling. This area will be used by the base building and tenants to collect mixed paper, corrugated cardboard, glass, plastics and metals. Additionally, appropriate measures will be taken for the safe collection, storage and disposal of batteries, mercury-containing lamps, and electronic waste.

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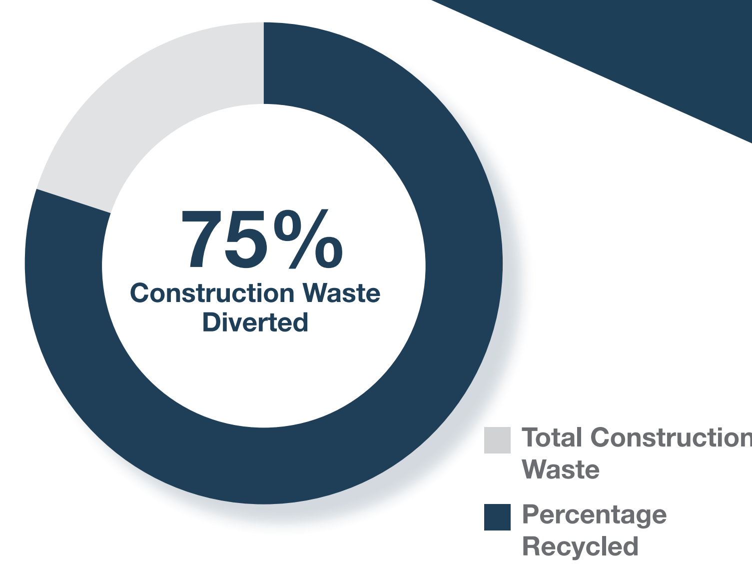

Figure 3: Construction Waste Diversion

Recycling practices are communicated to the tenants through the Tenant Guidelines. By incorporating recycling infrastructure early in the design process, the base building hoped to encourage successful implementation of recycling practices once operations begin.

3.4 Energy Conservation

3.4.1 Building Envelope

The building has a high-performance envelope with four main elements: glazed partitions with thermally-broken frames; spandrel windows, concrete walls, and a concrete roof. The double-pane low-e curtain wall system is filled with argon gas that reduces the amount of heat loss through the window section. The second component of the envelope is a spandrel wall system, utilizing a R-20 Batt insulation, that has an effective R-value of R-8. Precast concrete panels include an R-17 spray-applied polyurethane foam insulation as the third element of the building envelope. The polyurethane foam insulation prevents drafts while also increasing the air-tightness of the building. The final component is the modified bitumen concrete roof with R-27 polyisocyanurate insulation. The roof is also toped with a white cap sheet, which reduces the building's cooling loads.

3.4.2 Lighting

The lighting system at York Major Medical Centre uses all LED fixtures to maximize efficiency and reduce the lighting power density (LPD). Energy-saving lighting controls for the building include BAS control, occupancy, and daylight sensors. The enhanced lighting system reduces energy consumption and can help improve productivity.

3.4.3 Heating & Cooling Systems

The HVAC system consists of a central plant located within the mechanical penthouse with additional equipment throughout the building. Heat rejection is achieved via an open cooling tower paired with a high-efficiency water-cooled chiller that has a coefficient of performance of 5.57. Variable speed circulating pumps are provided to deliver chilled water throughout the facility. The chiller has three-way isolation valves that are integrated with the building automation system to provide free cooling based on outdoor air temperature. Modulating condensing boilers, rated at 96% thermal efficiency, are complete with variable speed circulating pumps that deliver hot water throughout the facility. Suspended fan-coil units are provided with ECM motors for variable speed operation, allowing the fan to start slowly and run more consistently. This allows the fan-coil units to conserve energy while satisfying space temperature setpoints.

3.4.4 Outdoor Air

The rooftop energy recovery ventilator (ERV) is a specialized air handler containing an enthalpy recovery heat exchanger wheel, which recovers waste heat from the building exhaust to preheat cold outside air in winter that is used for ventilation. This preconditioning of the outside air reduces the load that the HVAC unit must handle, and hence reduces the required capacity of the mechanical equipment.

The outdoor air for the building is provided by a central ERV that is then provided to the spaces through fan-coil units. The fan-coils can also regulate the amount of fresh air being provided to the space as they are equipped with carbon dioxide sensors that will register the need for additional fresh air, which is usually dependent on the space occupancy. The ERV also modulates the amount of fresh air being provided to the building in response to the demand for fresh air coming from the fan-coil units.

Figure 4: Mechanical Penthouse

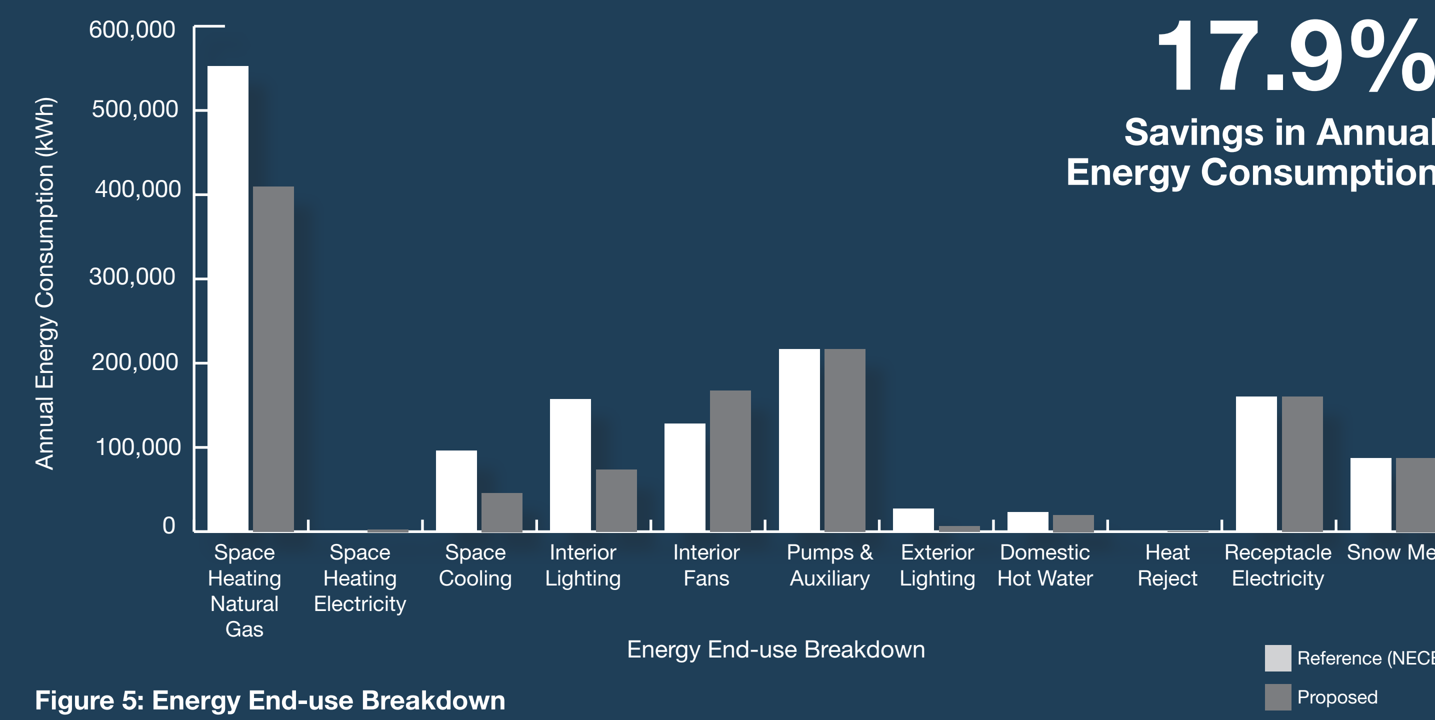

Figure 5: Energy End-use Breakdown

3.4.5 Energy Design Analysis

An energy goal for the project was established in the early design phase, at 15% cost savings. From there, a preliminary energy model was created, and the building design configuration and heating and cooling load reduction strategies were analyzed for possible performance improvements. Energy-efficient building control systems, improved insulation, and LED lighting were included in the design to help reduce energy needs. The current design has a EUI of 63.9 Kbtu/ft² or 0.73 GJ/m². The following are significant energy conservation measures (ECMs) that allowed the building to achieve this level of performance:

- Condensing Boilers
- Energy Recovery Ventilation
- High Performance Chiller
- Demand Control Ventilation
- Improved Lighting Power Density
- Daylight Harvesting
- Lower Fan Power

3.4.6 BAS

York Major Medical Centre is monitored by a building automation system. This computer-based system connects the sensors, HVAC, and lighting systems, enabling them to communicate on a single platform to share information that enhances occupant comfort and efficiency. Therefore, the medical centre is fully automated with lighting levels and HVAC delivery specifically to coincide with tenant hours of operation that will adjust to seasonal changes in sunlight and temperature.

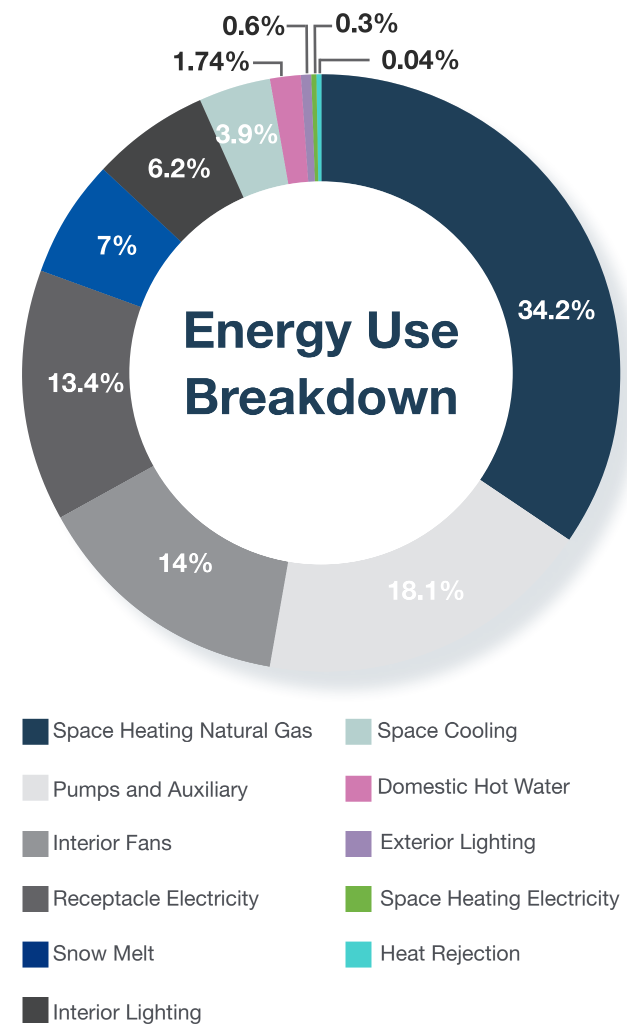

Figure 6: Energy Use Breakdown

York Major was committed to designing, constructing and operating a building with a reduced environmental impact by incorporating sustainable initiatives.

3.5 Water Conservation

The project team specified base-building plumbing fixtures and fittings that were low-flow. 4.2 litres per flush (LPF) flush valves were selected along with 1.32 litres per minute (LPM) lavatories to reduce indoor potable water use by over 30%.

Outdoor water savings were achieved by selecting plant species based on their drought tolerance, hardiness and disease resistance requiring minimal maintenance requirements. The irrigation system installed is WaterSense Labeled, using smart technologies with watering schedules to better match plant species watering needs, allowing a total outdoor potable water use savings of over 63%.

Through a holistic lens to rainwater management via a master site approach, onsite rainwater runoff was reduced by replicating the natural hydrology of the site, supporting its key regional features such as wetlands, headwater streams and groundwater aquifers. This includes the use of infiltration facilities and stormwater management facilities (SWMFs). These facilities are located throughout the master site and ultimately reduce runoff and increase infiltration from existing current conditions. The SWMFs within this larger master site boundary have been specifically designed to either enhance infiltration, decrease the demand on the underling aquifer for irrigation, supply flows to the on-site wetland, and/or provide water supply to local river systems.

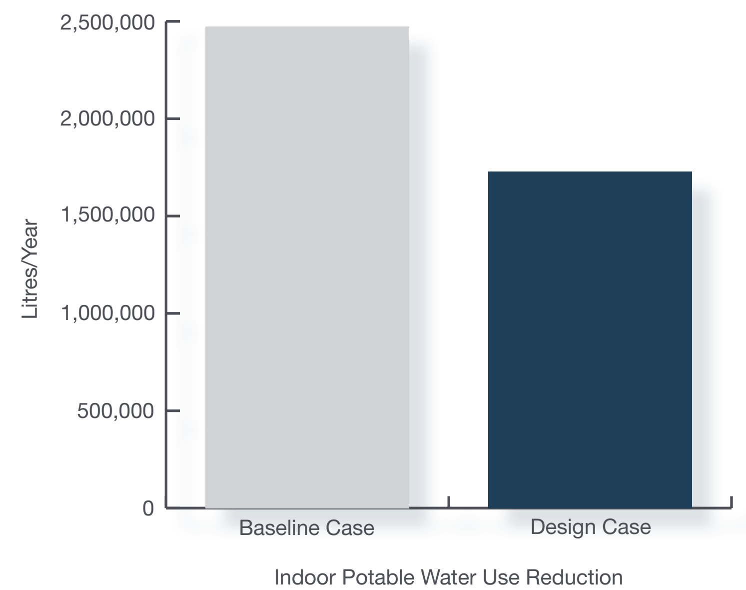

Figure 7: Annual Indoor Water Use Savings

The team had a goal to conserve water used for cooling tower makeup by providing necessary controls. As such, the cooling tower is equipped with makeup water meters to monitor water that is fed into the system as well as conductivity controllers with overflow alarms to prevent overflow in case of makeup water valve failure. Additionally, the system is equipped with drift eliminators that are responsible for capturing droplets and returning them into the reservoir at the bottom on the cooling tower for recirculation.

3.6 Indoor Air Quality

During construction, an Indoor Air Quality Management (IAQ) Plan was created and carried out. This Plan adhered to the recommended control measures outlined in the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 2nd edition, 2007, ANSI/SMACNA 008-2008, Chapter 3. IAQ measures included HVAC protection, source control, pathway interruption, housekeeping, scheduling, and protection of absorptive materials. Additionally, as the fan-coil units and ERV were operating during construction, temporary MERV 8 filtration media was installed at each inlet/duct opening and monitored through inspection reports during construction. Before the building was occupied by tenants, temporary media was replaced with higher, MERV-13 efficiency filters for all suspended fan-coil equipment.

As a high priority for a medical centre, all paints and coatings, adhesives and sealants, walls, insulation, ceilings, and composite wood products used within the weatherproofing membrane were selected based on their low-emitting/nonemitting criteria for volatile organic compounds (VOCs). The sub-contractors selected wet-applied products that met the VOC limits outlined by the South Coast Air Quality Management District (SCAQMD Rule 1113 and 1168). Additionally, all products (excluding composite wood) were to be tested and deemed compliant in accordance with the CDPH Standard for TVOCs (i.e., GreenGuard Gold, Green Label Plus, FloorScore, ClearChem declared, etc). Composite wood products were certified to contain ultra-low-emitting formaldehyde (ULEF) or no added formaldehyde resins (NAF) under EPA TSCA Title V1 or CARB ATCM.

A No-Smoking Policy was created to prevent the exposure of occupants, indoor surfaces, and ventilation/air distribution systems to tobacco smoke. Adhering to the Smoke Free Ontario Act 2017, smoking is prohibited indoors. Furthermore, smoking is also prohibited outside within 7.5 metres of all building entrances, outdoor air intakes, and operable windows. To communicate this policy, signage is posted within 3 metres of all building entrances, including the overhead door for the underground garage.

Although the KVLS is closed, the exposure to methane gas still exists. Methane is a flammable gas that can ignite and be explosive at high levels when mixed with a heat source and not enough air to dilute the gas to levels below its explosion point. Through thoughtful design and monitoring measures, the risk of combustion was minimized in the underground parking garages where the gas may potentially be present. As the underground parking is an area of potential source ignition, a permanent methane monitoring system is installed to continuously monitor concentrations of the gas. This monitoring system is connected to the building automation system (BAS) for real-time monitoring. The monitoring system is equipped to alarm when levels exceed at least 20% LEL. In addition, the underground garage ventilation system has been thoughtfully designed with exhaust fans to remove combustible methane gas accumulation. When gas concentrations exceed 20% LEL, motorized fresh air dampers will open to 50% and an exhaust fan will turn on. The exhaust fan will remain on and fresh air damper open until concentrations fall below the pre-set limit. When concentration levels exceed 40% LEL, both visual and audible alarms will trigger. The motorized fresh air dampers will open fully and an additional exhaust fan will engage until concentration levels are below the threshold. With the combination of the methane sensors with alarms and communication with the exhaust fans, the building's monitoring system will maintain safe conditions within the parking garage.

3.7 Safety First Design Strategy

Fresh outdoor air is distributed throughout the multi-level facility to satisfy the requirements of ASHRAE 62.1-2016 via a central energy-recovery ventilator. The energy-recovery unit is provided with variable frequency drives to regulate the fan speed and airflow based on static pressure setpoints. High efficiency MERV-10 pre-filters are provided at the inlet of the unit and return air section to capture contaminates from outdoor and recirculated air. Supply air passes through MERV-15 final filters to deliver fresh air throughout the building while reducing indoor air pollutants such as bacteria and odors.

To meet the obligations of providing a safe workplace for building occupants, a Safety First: Management and Operation Plan was developed to mitigate the spread of COVID-19. The Plan includes building preparation, workforce preparation, access control, social distancing, green cleaning, touch point reducing, and communication. In addition, a daily journal for both building management and occupants will be kept assessing management practices. To accompany this effort in mitigating the spread of COVID-19, the ventilation system was designed to maximize fresh air intake in accordance with ASHRAE 62.1-2016 while using MERV-13 high-efficiency filtration media for all fan-coil units.

3.8 Other Sustainable Features

Restoring habitat for plant and wildlife species was also an important goal for this project, the Owner of the project has donated 49 acres of woodlot just north of the Eagles Nest Golf Course to the City of Vaughan, where the land is regulated by the Toronto Regional Conservation Authority (TRCA). The donation of land provides financial support equivalent to $10.37/m^2$ to conservation efforts.

Figure 8: Air Handling Equipment Temporarily Sealed During Construction

YORK MAJOR

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