100%CD LEED ENERGY MODEL REPORT

YORK NORTH DISTRICT ROAD FACILITY

23/05/2025

MCW Consultants Ltd.

TABLE OF CONTENTS

100%CD LEED ENERGY MODEL REPORT
YORK NORTH DISTRICT ROAD FACILITY
23/05/2025

MCW Consultants Ltd.

1 EXECUTIVE SUMMARY

An energy model was developed for the York North District Road Facility expansion to evaluate the energy performance of the proposed design compared to ASHRAE90.1-2010. The purpose is to determine the number of LEED v4 Optimize Energy Performance credits and compliance with the Minimum Energy Performance prerequisite using the EApc95 pilot credit.

The building design utilizes a number of energy conservation measures including:

- Improved mechanical system:
  - Air-source VRF
  - ERVs for ventilation heat recovery
- Superior envelope with high level performance
- Reduced lighting power through the use of LED lighting

Compared to the ASHRAE90.1-2010 the design achieves:

27.6%	Or 48 eMWh in Annual Energy Savings
9.7%	In energy cost savings
✔	Compliance with Minimum Energy Performance prerequisite for LEED v4
12	LEED v4 Optimize Energy Performance Points

2 INTRODUCTION

The proposed York North District Road Facility expansion is a road maintenance facility in Georgina, ON that expands the existing facility at this location. The energy model is based on the current revit models and drawings issued in May 2025.

The energy analysis was carried out in IES<VE> 2023, an ANSI/ASHRAE Standard 140 accredited software tool. The purpose is to determine the number of LEED v4 Optimize Energy Performance credits the design achieves and evaluate compliance with the Minimum Energy Performance prerequisite. This is done by creating energy models of both the Proposed design and an ASHRAE90.1-2010 baseline model.

3 ENERGY TARGET AND ENERGY EFFICIENCY MEASURES

The purpose of this report is to show that the design meets the Minimum Energy Performance prerequisite for LEED v4 and determine the number of points the design achieves for the Optimize Energy Performance credit. The level of energy efficiency is determined by comparing the design to the ASHRAE90.1-2010 reference building.

The building design utilizes a number of energy conservation measures including:

- Improved mechanical system:
    - Air-source VRF and Air-to-water heat pump
    - ERVs for ventilation heat recovery
- Superior envelope with Passive House performance level
- Reduced lighting power through the use of LED lighting

Because of the high level of performance expected relative to the baseline a total of 15 LEED points is being targeted for this design.

4 GENERAL ENERGY MODEL DETAILS

4.1 MASSING & CONFIGURATION

A building energy model was built in IES<VE> 2023 software. The geometric model can be seen in Figure 1 below. The model includes only the new construction portion (blue) with existing buildings shown in magenta.

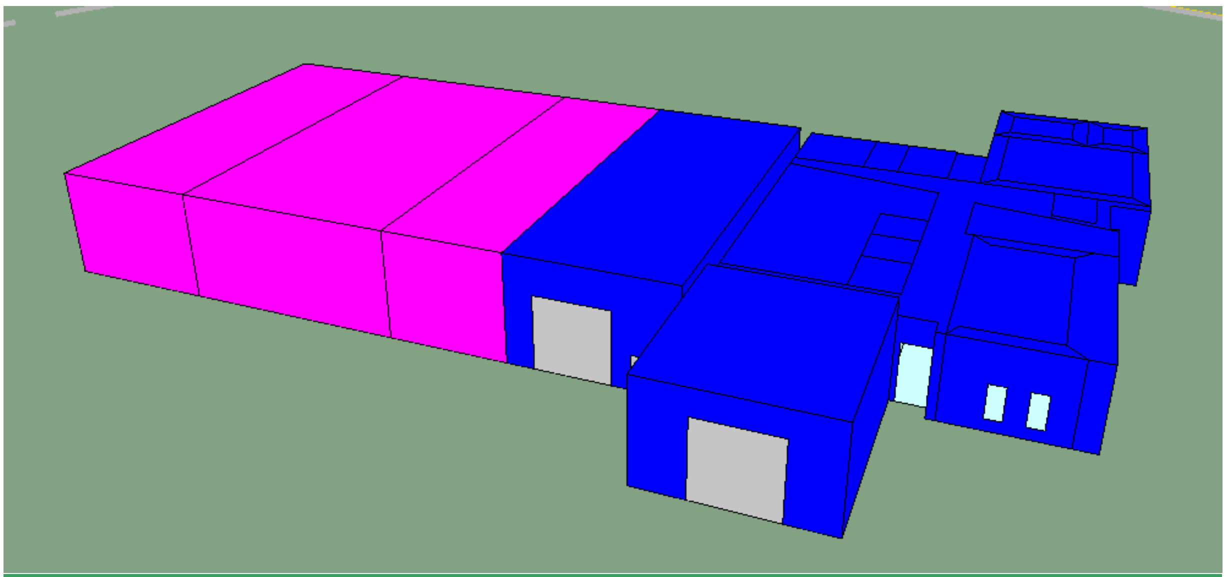


FIGURE 1: YORK DISTRICT ROAD FACILITY 3D MODEL BUILT IN IES <VE>

4.2 WEATHER DATA

The Egbert, ON weather file was used as this was the closest, most appropriate hourly CWEC[1] weather file available. Figure 2 shows the hourly outdoor air temperatures from the weather file.

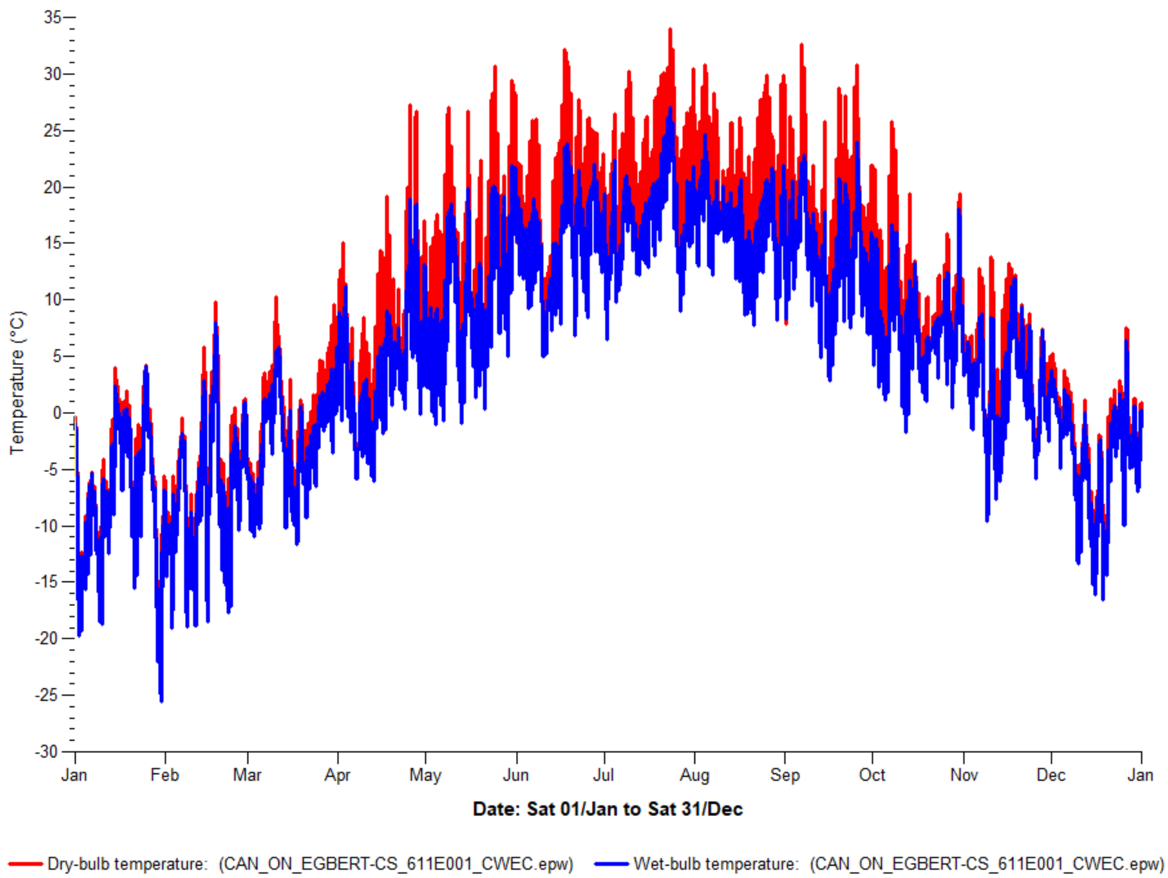


FIGURE 2: CWEC WEATHER FOR EGBERT ON

[1] CWEC (Canadian Weather for Energy Calculations) files contain hourly weather observations representing an artificial one-year period specifically designed for building energy calculations. Produced by Numerical Logics in collaboration with Environment Canada and the National Research Council of Canada, CWEC hourly files represent weather conditions that result in approximately average heating and cooling loads in buildings.

4.3 INDOOR CONDITIONS

The following temperature set point values, shown in Table 1, were defined in the energy model:

TABLE 1: MODELLED TEMPERATURE SET-POINT VALUES

	Summer	Winter
Office Areas	23.9°C/26.7 setback	20.6°C/15.6°C Setback
Garage Areas	-	12°C

5 PROPOSED ENERGY MODEL

5.1 BUILDING ENVELOPE

The following thermal properties in Table 2 have been used for the construction assemblies in the energy model. The effective performance values were determined based on the current drawings.

TABLE 2: SUMMARY OF BUILDING ENVELOPE THERMAL PROPERTIES	
Component	Effective U-Value (Btu/hr ft^2-°F)
Garage Walls	U-0.0235
Office Walls	U-0.0232
Opaque Curtain Wall	U-0.0433
Garage Roof	U-0.04
Office Roof	U-0.026
Punched Window	U-0.234
Curtain Wall Glazing	U-0.239
Overhead Doors	U-0.176

5.2 INTERNAL GAINS, DOMESTIC HOT WATER AND OUTDOOR AIR

Space occupancy in the IES <VE> model is based on ASHRAE-90.1 and outdoor air rates are based on ASHRAE62.1. The lighting power density is based on the design and equipment load are based on ASHRAE90.1 defaults. Table 3 gives a summary of the lighting and receptacle loads for the proposed model. The peak DHW demand is set as 30 gal/hr per hour building-wide in the model based on ASHRAE90.1 domestic hot water loads.

TABLE 3: INTERNAL LOAD INPUT SUMMARY

Space Type	Receptacle Load Density (W/ft^2)	Lighting Power Density (W/ft^2)
Garage	1.0	0.4
Electrical/Mechanical	0.2	0.252
Conference/Meeting	1.0	0.836
Corridor	0.2	0.372
Lunch Room	1.0	0.678
Lobby	0.0	0.437
Enclosed Office	1.0	0.966
Open Office	1.5	0.725
Restrooms and Locker	0.5	0.5

5.3 HEATING, VENTILATION AND AIR CONDITIONING SYSTEMS

VRF systems with a roof mounted ERV provide heating and cooling to the office spaces. The garage is served by natural gas fired radiant tube heaters with additional hydronic unit heaters for supplementary heat to recover the space temperature when the overhead doors are opened. Ventilation in the garage areas is provided by an exhaust fan.

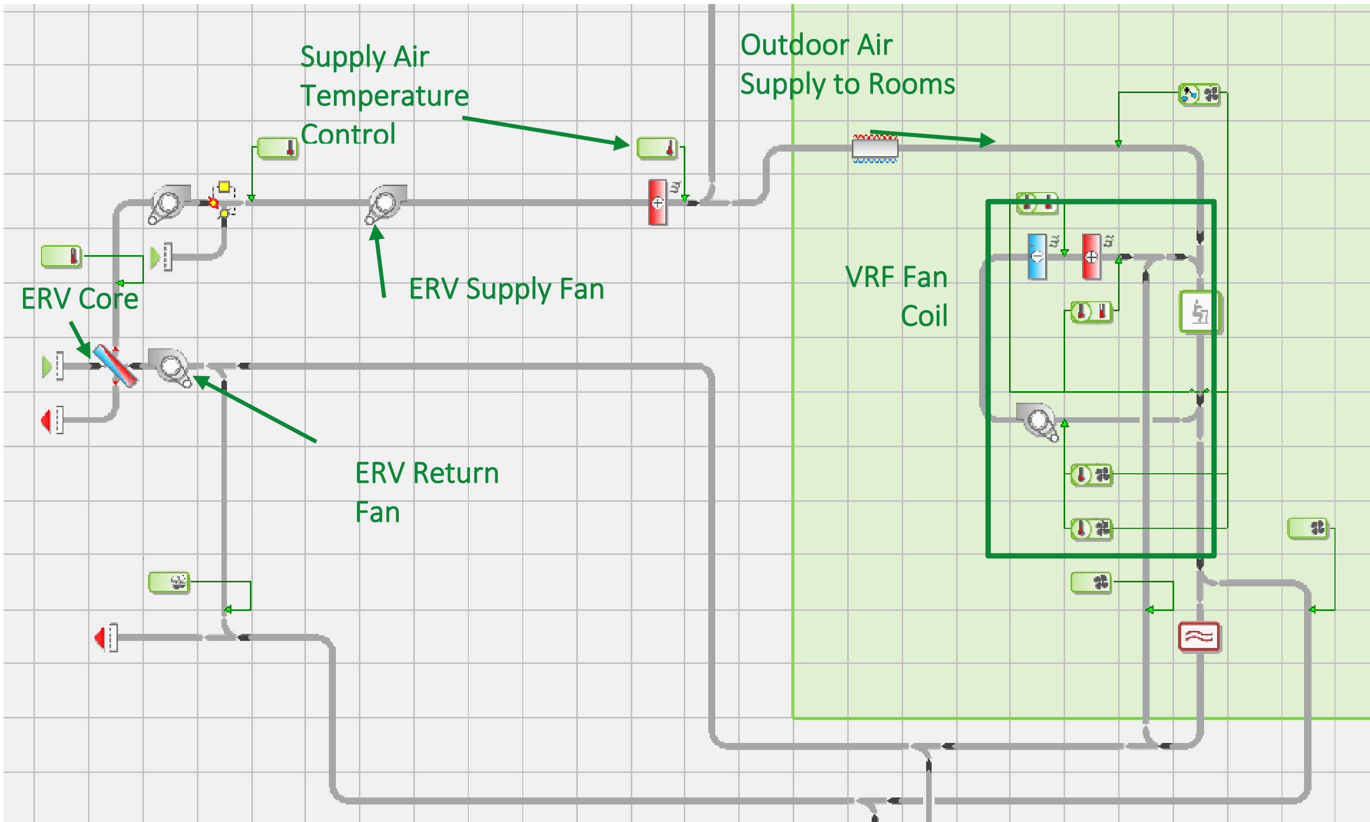


FIGURE 3: OFFICE AREA VRF SYSTEM

The basic settings of the HVAC systems in this design are summarized in Table 4.

TABLE 4: SUMMARY OF SYSTEMS IN IES <VE> MODEL

Area Served	System	Basic Settings
Office Area	Air-source VRF with ERV for ventilation	COP cooling 3.48, COP heating 3.66 Sensible heat recovery effectiveness: 77% Latent heat recovery effectiveness: 65%
Garage Areas	Radiant tube heaters with unit heaters	Garage system runs at set-back airflows most of the time with 4 hours per day peak airflow.
Sign Garage	Radiant tube heaters with unit heaters	Garage system runs at set-back airflows most of the time with 4 hours per day peak airflow.

6 BASELINE ENERGY MODEL

The reference energy model was generated automatically by the IES<VE> software based on the requirements of ASHARE 90.1-2010 Appendix G. The baseline design will be different in several areas compared to the proposed design model. These differences include the thermal resistance of envelope elements, and the capacities, efficiencies, and flow rates of mechanical equipment. Schedules, thermostat set points, and receptacle loads remain the same in both the models.

6.1 BUILDING ENVELOPE

The building envelope thermal properties of the baseline model are set according to ASHRAE90.1 for climate zone 6, as presented in Table 5.

TABLE 5: SUMMARY OF BUILDING ENVELOPE THERMAL PROPERTIES

Component	Effective U-Value (Btu/hr ft^2-°F)
Exterior Walls	Steel-framed wall U-0.064
Roof	Insulation above deck, U-0.048
Glazing	Metal framing U-0.45 SHGC=0.4

6.2 INTERNAL GAINS, DOMESTIC HOT WATER AND OUTDOOR AIR

The occupancy, receptacle load, DHW load, and all profiles are set the same as the proposed model. The lighting power input is based on ASHRAE90.1-2010. The lighting schedule is the same as the proposed model and based on space types as shown below in Table 6.

TABLE 6: BASELINE LIGHTING POWER SUMMARY

Space Type	Lighting Power Density (W/ft^2)
Garage	0.67
Electrical/Mechanical	0.95
Conference/Meeting	1.23
Corridor	0.66
Lunch Room	0.65
Lobby	0.90
Enclosed Office	1.11
Open Office	0.98
Restrooms and Locker	0.98
Storage	0.63

6.3 HEATING, VENTILATION AND AIR CONDITIONING SYSTEMS

The baseline model HVAC system type is selected from ASHRAE90.1-2010. System 3 Packaged Single-Zone heat pumps were chosen for all spaces.

The basic settings of the HVAC systems in the baseline model are summarized in Table 7.

TABLE 7: SUMMARY OF SYSTEMS IN IES <VE> MODEL

Area Served	System	Basic Settings
Office Areas	System 3 Packaged Single Zone Heat Pump	Constant volume air-source heat pump for heating and cooling with COPs as per ASHRAE90.1-2010
Garage	System 9 Packaged Single Zone furnace	Constant volume furnace for heating with efficiency as per ASHRAE90.1-2010 with no cooling to match Proposed.

7 ENERGY SIMULATION RESULTS

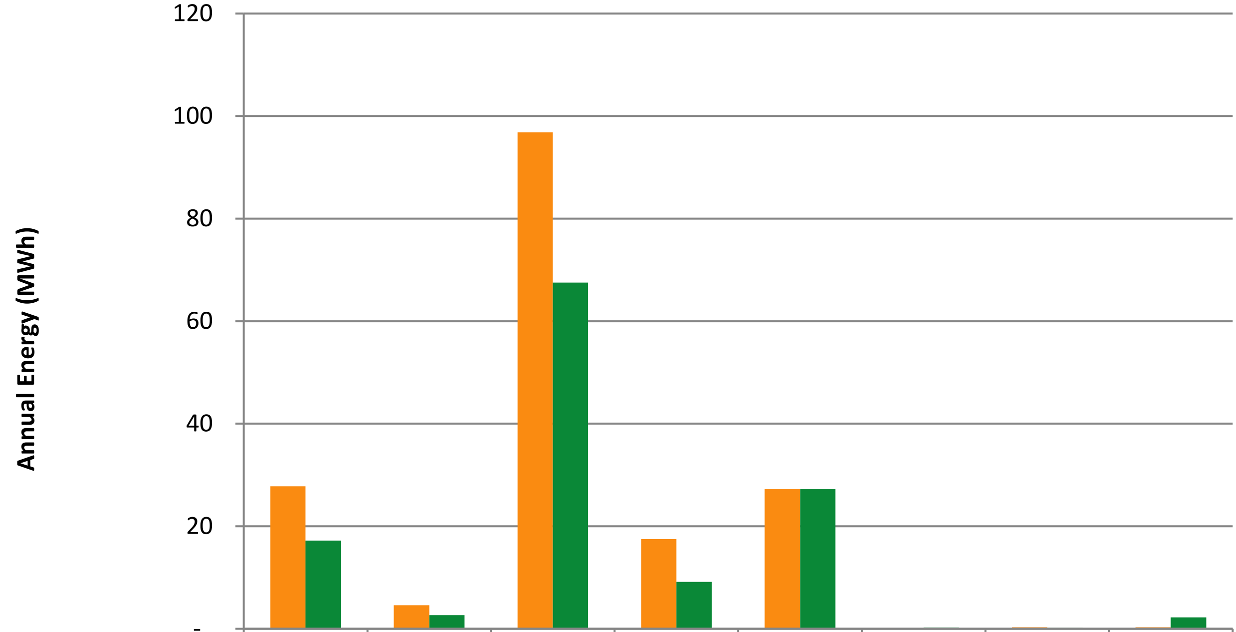
7.1 ANNUAL ENERGY PERFORMANCE

The annual energy consumption model results for the facility are broken down by end use and type of energy in Table 8.

TABLE 8: ANNUAL ENERGY CONSUMPTION END USE

End-Use	ASHRAE90.1-2010 Baseline			Proposed		
	Natural Gas (MWh)	Electricity (MWh)	Subtotal (MWh)	Natural Gas (MWh)	Electricity (MWh)	Subtotal (MWh)
Lighting	-	28	28	-	17	17
Cooling	-	5	5	-	3	3
Heating	75	22	97	31	37	68
Fans	-	18	18	-	9	9
Receptacles	-	27	27	-	27	27
Pumps	-	0	0	-	0	0
Heat Rejection	-	0	0	-	0	0
Domestic Hot Water	-	0	0	-	2	2
Total	75	100	175	31	96	126
Savings						27.6%

Figure 4 shows the annual energy consumption end-use for both the proposed and reference buildings.



	Lighting	Cooling	Heating	Fans	Receptacles	Pumps	Heat Rejection	Domestic Hot Water
ASHRAE-90.1-2010	28	5	97	18	27	0	0	0
Proposed	17	3	68	9	27	0	0	2

FIGURE 4: ANNUAL ENERGY CONSUMPTION IN PROPOSED MODEL AND BASELINE MODEL

As shown, the energy savings are mostly coming from a mix of heating, lighting, and fan energy. The energy savings in heating energy are due to a combination of a very efficient envelope, an efficient heating system with air-source VRF, and ventilation heat recovery. Lowering heating loads also lowers fan power as the systems have lower loads and require less air as a result.

7.2 OPTIMIZE ENERGY POINTS

The LEED optimize energy performance credit references energy cost for the savings calculations. The EApc95 pilot credit pathway allows for considering GHG savings and source energy savings. Using this path the total savings are 31.8% savings and 12 LEED EAc1 points.

8 CONCLUSIONS

The design meets the requirements of the Minimum Energy Performance prerequisite and achieves 12 LEED EAc1 points for Optimize Energy Performance. These savings are due to:

- Improved mechanical system:
  - Air-source VRF and Air-to-water heat pump
  - ERVs for ventilation heat recovery
- Superior envelope with near Passive House performance level
- Reduced lighting power through the use of LED lighting LEED Points

9 ADDITIONAL MODELLING NOTES

9.1 DISCLAIMER

It is important to note that this study is only applicable for ASHRAE90.1-2010 comparison purposes based on current design and available information, as detailed in this report. **It is not a prediction of actual energy consumption or costs of the proposed design after construction.** Actual experience will differ from these calculations due to variations such as occupancy, building operation and maintenance, weather, energy use not covered by the ASHRAE90.1-2010 standard, changes in energy rates between design of the building and occupancy, and precision of the calculation tool.

207 QUEEN'S QUAY WEST, SUITE 615
TORONTO, ONTARIO
M5J 1A7

WWW.MCW.COM