MacBride Museum of Yukon History

Whitehorse 2017

reLoad Sustainable Design Inc. used the IESVE to carry out extensive energy modeling for a new addition to the MacBride Museum, predicting savings of 37% in Carbon Emissions and 38% in Energy Costs compared to Canadian Energy Code.

Key Facts

- Cold northern location: Winter -49 ºC, Summer 29 ºC
- 1650 sqm, 3 storey addition
- 37% Carbon Emissions savings compared to NECB 11
- 38% Energy Cost savings compared to NECB 11
- 41% Peak Demand savings compared to NECB 11

The MacBride Museum of Yukon History is located in Whitehorse, Canada, a very cold northern location with temperatures of -49 ºC in winter time and up to around 29ºC in summertime. The site currently has 4 low rise historical buildings.

Due to increased visitor numbers in the summer months, the museum wanted to build a low carbon, energy efficient addition to increase capacity. The addition, completed in 2018, is a 1650 sqm 3 storey building all above ground. It has an exhibit area and, as it's not connected to the existing buildings, has its own HVAC and lighting systems.

Using IESVE, reLoad Sustainable Design performed extensive energy modeling to inform the design process and advise on the most energy efficient design options during all phases of design. It also set out to show compliance with the NECB 11 Canadian energy code, in which it revealed significant savings against in every category as shown in the table below.

Summary Annual Consumption		MacBride Proposed Design	NECB 11 Compliant Building	Savings
Total Energy Use Intensity (EUI)	kWh/m^2	97	155	**37%**
Total Energy Consumption	kWh/year	160,443	256,008	**37%**
Peak Demand	kW	109	185	**41%**
Electricity Demand Cost	$/year	11,358	19,277	**41%**
Electricity Consumption Cost	$/year	24,650	39,272	**37%**
Total Energy Cost	$/year	36,008	58,549	**38%**
Total Carbon Emissions	tCO_2e/year	1.28	2.05	**37%**

Cost savings were important to the museum, as was a reduction in peak demand because the energy modeling showed this really drove the yearly cost.

Based on the results from the IESVE, the team from reLoad Sustainable Design were able to advise on many energy conservation measures. This included, the decision to install high efficiency reverse flow heat recovery units. The team discovered that this would eliminate the need for electricity, so even though the system is more expensive, over time this would result in better cost savings and also reduced peak demand. CO2 sensors will also be installed in the space to reduce ventilation rates on the museum in occupancy and also to reduce morning start up peak, resulting in good cost savings for electricity.

The reLoad team also suggested that the operation of the system start up and the lighting system should be scheduled for a set sequence because the analysis showed that the peak happened in the morning which really drives the demand costs over the year.

> *"The IESVE helped us to meet our client's needs and deliver an extremely energy and cost efficient design. The detailed results produced for different parts of the system within ApacheHVAC were very useful, as was the detailed output results which allowed us to really easily troubleshoot and track where any problems were."*
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> Martina Soderlund, reLoad Sustainable Design Inc.

Project Team

- Owner: MacBride Museum
- Architect: Kobayashi + Zedda Architects Ltd.
- Building Performance Engineers: reLoad Sustainable Design Inc.