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ARCHIE BROWNING SPORTS CENTRE
CALIBRATION REPORT

JANUARY 30, 2026

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CALIBRATION REPORT

WSP

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WSP CANADA INC.
2525 DANIEL-JOHNSON BLVD., SUITE 525
LAVAL, (QUÉBEC) H7T 1S9

T +1 450-686-0980
F +1 450-686-0987
WSP.COM

TABLE OF CONTENTS

1 INTRODUCTION

1.1 CONTEXT

WSP energy performance team was mandated by Township of Esquimalt to assess energy benefits of a list of energy conservation measures options that they will develop for the Archie Browning Sport Centre located in Esquimalt, British Columbia. The objective is to create a calibrated energy model in IESVE based on building documents, utilities, and monitored data. Afterwards this model will be used to analyze energy conservation measures.

1.2 REFERENCE DOCUMENTS

This energy modeling was prepared based on the following reference documents:

- Site Visit information
- Utility bills
- Building Automation System

1.1 DISCLAIMER

Plant loads estimates presented in this report are preliminary values. They will be refined during the energy model calibration process. If WSP energy performance team can have access to monitored data from the BAS, theoretical results from the energy model can be compared to actual data.

2 INPUT PARAMETERS

2.1 BUILDING

In this section are listed the main parameters specified in IESVE to estimate the plant peak heating and cooling loads. Please note that the IESVE energy model does not include the snowmelt system.

- **Building envelope areas**

	TOTAL AREA		GLAZING AREA		WINDOW TO WALL & SKYLIGHT TO ROOF RATIOS
	(m^2)	(ft^2)	(m^2)	(ft^2)	
North Walls	534.0	5747.9	68.8	740.6	12.9%
East Walls	898.2	9668.1	44.4	477.9	4.9%
South Walls	572.1	6158.0	15.6	167.9	2.7%
West Walls	1297.0	13960.8	58.1	625.4	4.5%
Roof	5508.6	59294.0	2.3	24.8	0.0%

- **Building envelope opaque surfaces effective thermal resistances**

	RSI (M^2-K/W)	U-VALUE (W/M^2.K)
Walls	0.45	1.66
Flat Roof	0.74	1.14
TPO Roof	1.95	0.48

- **Building envelope glazing thermal conduction and shading coefficient**

	U (W/M²-K)	SHGC
Windows	3.12	0.4

- **Internal gains**

  Equipment and people gains are set at ASHRAE 90.1-2010 values. Please refer to the following table for more details.

SPACE FUNCTION (NECB 2011)	EQUIPMENT (W/M2)	PEOPLE (M2/P)
Conference/ Meeting/ Multipurpose	10.764	1.858
Corridor/ Transition	2.153	0
Dining area – Bar lounge/ Leisure dining	10.764	0.929
Electrical/ Mechanical	2.153	0
Food Preparation	16.146	1.328
Gymnasium/ Fitness Center – Exercise Area	5.382	9.290
Healthcare Facility – Exam Treatment	16.146	9.290
Lobby	5.382	0.620
Locker Room	5.382	9.290
Office	10.764	18.581
Restrooms	0	0
Sales area	5.382	6.194
Stairs	0	0
Storage	0	0
Workshop	2.153	4.645
TOTAL	**14.4kW**	**756**

- **Interior lighting:** The interior lighting is based on spec sheets, drawings and observation on site. The total interior lighting power is 28.565kW with average lighting power density of 4.35W/m2.

- **Building's occupancy**: Operation from 5:30-22:30 Monday to Sunday.

- **Weather file**: 2020 CWEC of Esquimalt Harbour (ASHRAE Climate Zone 5C)

- **Heating and cooling setpoint**: Heating: 24C, Cooling: 21˚C. Heating setback:18˚C, Cooling setback: 30C

- **Infiltration:** 3.7424 L/s-m^2 at 75Pa of exterior walls and roofs

- **Building envelope heating loads:** It is assumed that these loads are served by the radiant panels, radiators and convectors. However, from October to April, the fans will also cycle during the night when needed, to meet the heating setpoint.

- **Heating plant:** The heating plant is composed of two main gas boilers (370kW) supplies hot water for space heating, domestic hot water, ice resurfacing water and additional hot water for the ice melting pit.

- **Hockey and curling rink:**
    - Ice for the hockey rink and curling rink is provided by 4 ammonia compressors, connected to two chillers: 1 for the hockey rink and 1 for the curling rink. Heat is rejected to a rooftop evaporative condenser and a rooftop fluid cooler. Condenser heat is also recovered through 3 Therma-Stor tanks. The tanks are currently connected to the ice melting pit.

SYSTEM ID	AREA SERVED	SCHEDULE	CAPACITY (MBH)	YEAR INSTALLED	TYPE	DESCRIPTION
C-01	Hockey and Curling Rink	Ice Rink	420	1985	Compressor	Model Mycom N6WA
C-02	Hockey and Curling Rink	Ice Rink	420	1985	Compressor	Model Mycom N6A
C-03	Hockey and Curling Rink	Ice Rink	420	2000	Compressor	Model Mycom N6WA
C-04	Hockey and Curling Rink	Ice Rink	780	2011	Compressor	Model Mycom N4M
EC-01	Hockey and Curling Rink	Ice Rink	2285	2024	Evaporative Cooler	Model BAC VC1-205
AC-01	Hockey and Curling Rink	Ice Rink	89	2024	Fluid Cooler	Model REFPLUS FLD-113F-9-E013

    - The refrigeration plant is equipped with 4 pumps: 1 brine pump for each of the hockey and curling rinks, 1 for the glycol loop and 1 for the evaporative cooler loop. The brine pumps are turned on during summer.

PUMP ID	AREA SERVED	SCHEDULE	POWER (HP)	NOMINAL FLOW (L/S)	DESCRIPTION
P-01	Arena Brine Pump	Brine	25	63.1	2 speed pumps
P-02	Curling Brine Pump	Brine	15	37.9	2 speed pumps
P-03	Glycol Pump	Ice Rink	2	4.7	
P-04	Condenser Pump	Ice Rink	1.5	13.9	

    - Ice cooling load: ice temperature: -9˚C, emissivity: 0.90
    - Resurfacing: 100 gallon (378L) per flush, 7 times a day at 60˚C
    - Under slab heating: Electric resistance, slab heating temperature 3˚C

- **Domestic water use:** 3,244 m3 from water audit calculation

- **HVAC:**

SYSTEM	TYPE OF SYSTEM	SUPPLY FLOW RATE		OUTSIDE AIR FLOW RATE		FANS POWER
		L/s	cfm	L/s	cfm	kW
AHU-1	CAV	3256	6900			2.8
AHU-2	CAV					
AHU-3	CAV	3256	6900			2.8
AHU-4	CAV					
AHU-5	CAV					
AHU-6	CAV	566	1200			1.68
	CAV	1267	593			0.153
HRV-1						
DH-1	VAV	2360	5000			5.59
DH-2	CAV	531	1125			

3 CALIBRATION ADJUSTMENTS

3.1 COMPRESSOR EFFICIENCY

Compressor is assumed to have a COP of 2.9 with reference to the standard value according to Hydro-Québec's OSE program to reflect the ice making energy usage.

3.2 HEAT REJECTION

The model includes 1 VSD cooling tower to represent heat rejection by the evaporative cooler and fluid cooler.

4 RESULTS

4.1 CALIBRATION RESULTS

Township of Esquimalt provided utility data for the electrical consumption from May 2024 to April 2025. May 2024 to April 2025 has been selected for the model's calibration. The Figure 1 present the modelled electrical consumption compared to 12 months of electric utility data.

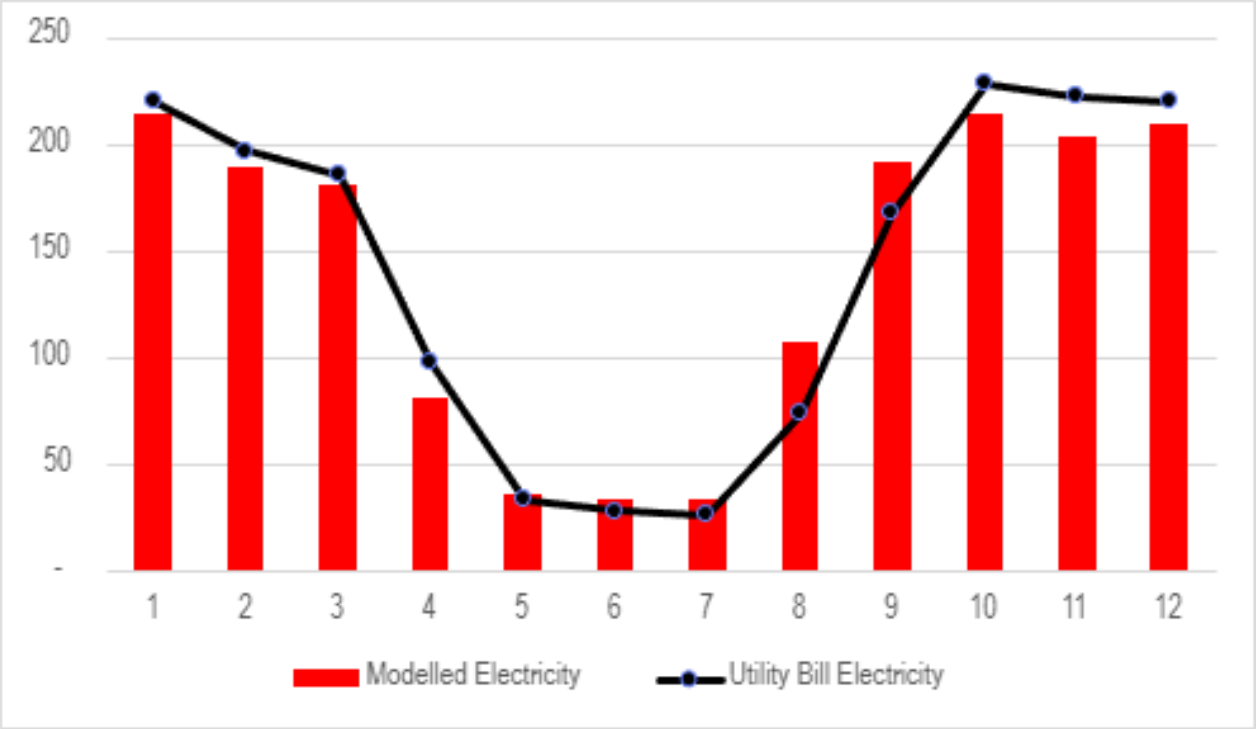

Figure 1 : Electricity Usage: Utility Bill vs Simulation Results

As shown in Table 41, the calibrated electricity results fall within an acceptable error. The modelled electricity consumption is well calibrated.

Table 4-1 : Electricity Calibration

	AVARAGED UTILITY BILL	MODEL	DIFFERENCE
Annual Electricity Consumption (kWh)	1,704,194	1,696,445	0%

Township of Esquimalt provided utility data for the natural gas consumption from May 2024 to April 2025. May 2024 to April 2025 has been selected for the model's calibration. TFigure 2 presents the modelled natural gas consumption compared to 12 months of the natural gas utility data.

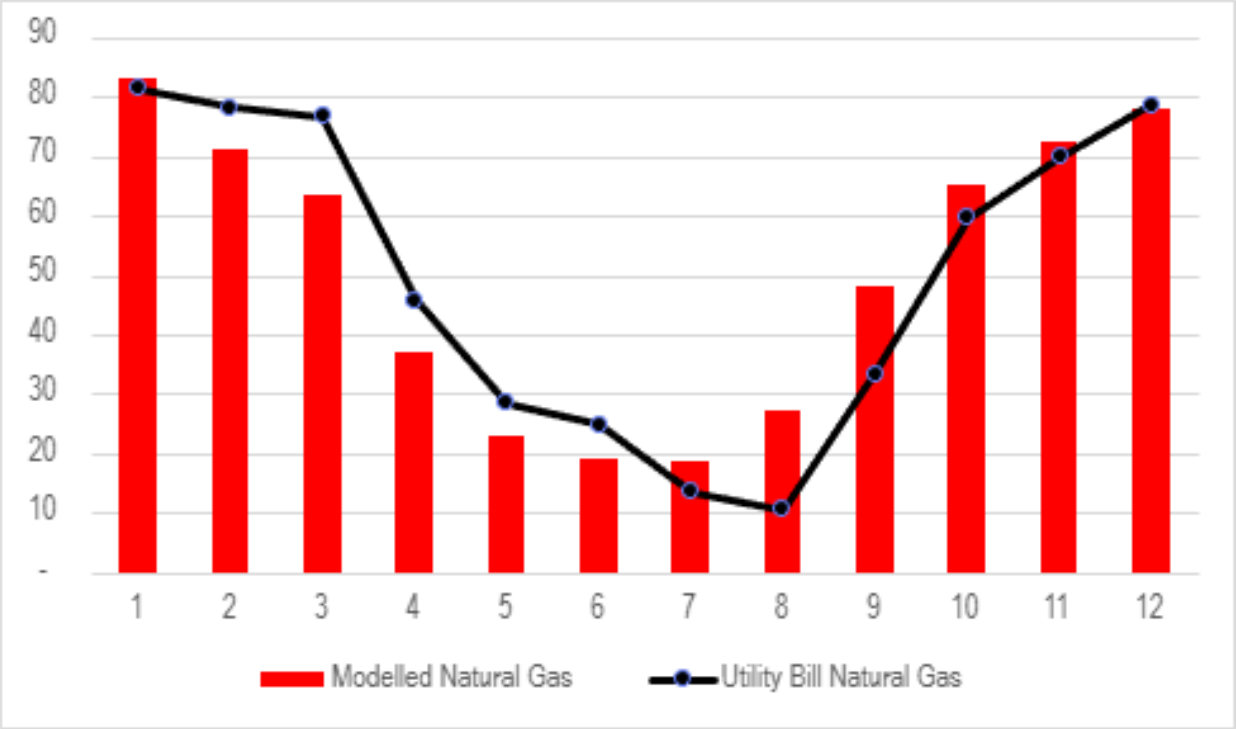

Figure 2 Natural Gas Usage: Natural Gas Utility Data vs Modeled Natural Gas

As shown in Table 42**Error! Reference source not found.**, the calibrated natural gas results fall within an acceptable error. The m odelled natural gas consumption is well calibrated.

Table 4-2 : Natural Gas Calibration

	AVARAGED UTILITY BILL	MODEL	DIFFERENCE
Annual Natural Gas Consumption (kWh)	601,574	618,880	3%

4.2 ENERGY END-USE BREAKDOWN

The energy end-use breakdown provided in Table 4-3 and Figure 3 are based on the modelled data.

		CONSUMPTION (MWh)	% ENERGY
NATURAL GAS	DWH	233	37,73%
	Space Heating	267	43,08%
	Dehumidification	119	19,19%
	TOTAL energy	**619**	**27,27%**
ELECTRICITY	Lighting	130	7,90%
	Equipment	72	4,36%
	Ice melt pit	248	15,03%
	Space Heating	36	2,15%
	Space Heating - Dehumidification	382	23,17%
	Space Heating - Under Slab Heating	46	2,78%
	Space Cooling	3	0,19%
	Space Cooling - Dehumidification	2	0,11%
	Ice making	381	23,08%
	Heat rejection	2	0,14%
	Fans	79	4,82%
	Pumps	268	16,26%
	TOTAL	**1 650**	**72,73%**
TOTAL MIXED ENERGY		**2 269**	**100,00%**

Table 4-3 Energy End-Use Breakdown

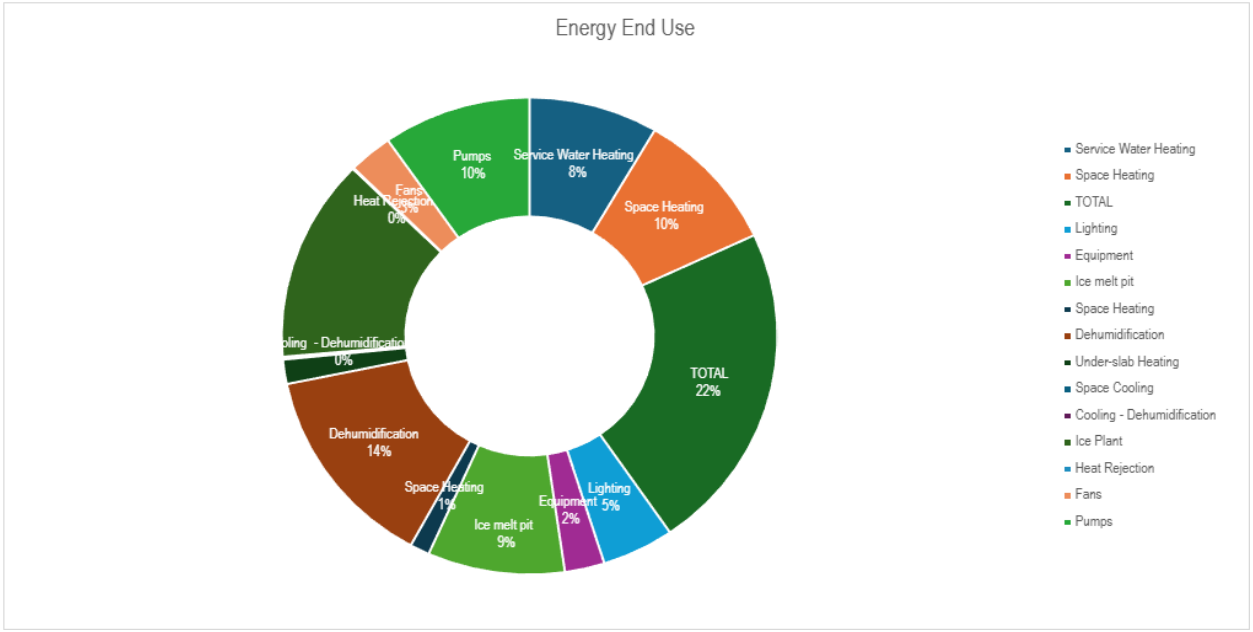

Figure 3 Energy End-Use Breakdown