Energy Step Code Step 3 Energy Modelling Inputs and Results

Pemberton Affordable Housing

Pemberton, BC

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SUMMARY AND RESULTS

The Pemberton Affordable Housing project consists of 4 storeys of wood-framed residential construction over a wood-framed ground-level commercial and support space. The building is intended to meet Step 3 of the provincial Energy Step Code. Modelling results indicate that the building will meet Step 3 targets for part 3 buildings using the modelling inputs described below. The adjusted TEDI/TEUI results of 23.5 / 94.1 meet the area-weighted Step 3 targets of 34.3 / 121.4 ekWh/sqm/yr. The greenhouse gas intensity (GHGI) target as specified by BC Housing is 5.50 kgCO2e/sqm/yr and the adjusted modelled result was 4.38 kgCO2e/sqm/yr.

Project Name:	Pemberton Affordable Housing
Location:	Lot 2 Harrow Rd, Pemberton, BC
Building Use and Occupancy	Multifamily Residential
Modelled Floor Area (MFA):	6,090 m^2 (65,530 sqft)
Number of Storeys/Units	5 / 63
Energy Standard:	Energy Step Code, Step 4
Energy Modelling Software:	eQuest v3.65 build 7163
Date:	2022-01-06
Simulator:	Brian Ward
TEDI/TEUI Step 3 Targets (ekWh/sqm/yr)	34.3 / 121.4
TEDI/TEUI Result (ekWh/sqm/yr, before corridor pressurization adjustment)	33.4 / 103.9
Corridor Adjustment Factor (ekWh/sqm/yr)	9.84 (based on 11.8 L/s/door of corridor pressurization)
TEDI/TEUI Result (Including corridor pressurization adjustment)	**23.5 / 94.1**
Greenhouse Gas Intensity Target (kgCO2e/sqm/yr)	5.50
Greenhouse Gas Intensity Result (kgCO2e/sqm/yr, before corridor pressurization adjustment)	6.20
Greenhouse Gas Corridor Pressurization Adjustment Factor (kgCO2e/sqm/yr)	1.82
Greenhouse Gas Intensity Result (Including corridor pressurization adjustment)	**4.38**

SIMULATION GUIDELINES USED

City of Vancouver Energy Modelling Guidelines v2.0

NECB 2011 Part 8

CLIMATIC INFORMATION

Climate Zone: 5
Heating Degree Days (HDD): 3350
Weather File: EPW Pemberton Airport

SCHEDULES

Suites: Occupancy, Lighting, Receptacles, Fans & Ventilation, Cooling, Heating and Domestic Hot Water operating schedules as per NECB 2011 Table A-8.4.3.2.(1)G

Other areas: based on Table A-8.4.3.3.(1)B

ENVELOPE

2X6 Wood-framed wall with R22 cavity batt and 25 mm continuous semi-rigid exterior insulation: Clear wall u-value: U-0.037

Thermal Bridging Guide effective wall u-value (See fig 2): U-0.066

Roof effective u-value (R40 insulation above deck): U-0.024

Slab-on-grade: R15 for 1.2m from perimeter

Vinyl Glazing u-value: U-0.25

Aluminum-framed u-value: U-0.38

Glazing SHGC: 0.27

Glazing Percentage: 24.6%

Opaque Doors: U-0.25

Note: infiltration modelled as per 2.4 of the COV guidelines for Step 4 buildings. In order to ensure a conservative airtightness target, a modelled infiltration rate of 0.20 L/s/sqm (3,241 sqm above-grade gross wall area) was utilized in the Step 3 model. This modelling rate results in a normalized air leakage rate (NALR/EALR) target of 1.02 L/s/sqm @ 75 Pa (5,687 sqm total envelope area).

HVAC

Ventilation Rates: ASHRAE 62.1-2001 (except addendum n). Corridor pressurization modelled @ 11.8 L/s/door (25 CFM/door) in residential spaces. Suites and corridor ventilation modelled as continuous operation.

Temperature Setpoints: Heating (22/18), Cooling (24)

HVAC Systems:

Suites – PTACs (10.8 EER) and electric resistance baseboard heat. Continuous ventilation via individual suite HRVs, sensible effectiveness = 83%, modelled as per 2.6.4 of the City of Vancouver Energy Modelling Guidelines.

Common/Amenity – Split Heat Pump (10.8 EER, 7.0 HSPF)

Corridor Makeup Air – 1,700 CFM continuous O/A, 81.0% Et gas-fired unit.

DOMESTIC HOT WATER

Modelled with 0.025 gpm/occupant as per 2.2.1 of COV guidelines. 95% Et gas-fired storage unit. Peak flow rate of 3.46 gpm (13.1 l/min). Low-flow fixture rates as follows:

1) Shower head: 6.6 L/min
2) Lavatory faucet: 3.8 L/min

LIGHTING

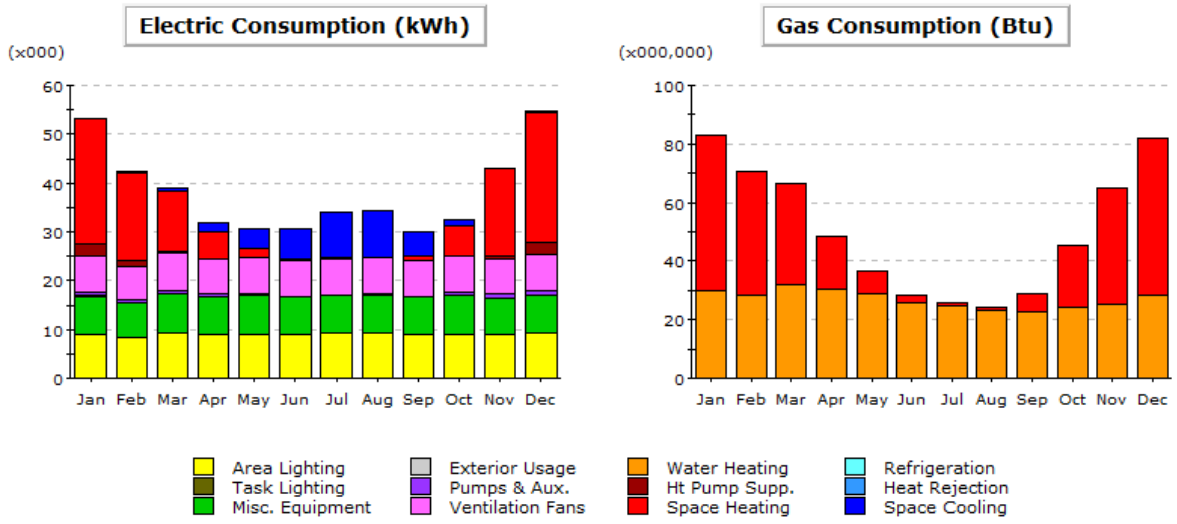
Lighting schedules and suite lighting power modelled as per the City of Vancouver Energy Modelling Guidelines v2. Lighting power of remaining spaces is based on assumed typical LED lighting design package.

Modelled lighting power densities (LPDs):	Suites – 0.46 W/sqft (as per EMG v2)
	Corridors – 0.60 W/sqft
	Storage – 0.40 W/sqft
	Stair – 0.60 W/sqft
	Commercial – 0.70 W/sqft
	Utility/Mechanical – 0.40 W/sqft
	Office – 0.70 W/sqft
	Lounge – 0.60 W/sqft
	Laundry – 0.60 W/sqft
	SSCS – 0.70 W/sqft
Modelled Exterior Lighting Power:	0.46 kW

PLUG LOADS

Suites modelled as 0.46 W/sqft (5 W/sqm) as per City of Vancouver guidelines. Remaining spaces loads and schedules modelled as per NECB table A-8.4.3.2

Project/Run: Pemberton Affordable Housing Step 3 - Baseline Design | Run Date/Time: 01/06/22 @ 08:41



Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.06	0.30	0.72	1.69	4.25	6.22	9.40	9.62	4.76	1.19	0.09	0.05	38.34
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	25.59	17.99	12.23	5.55	1.80	0.26	0.06	0.07	1.05	6.17	17.79	26.58	115.15
HP Supp.	2.35	1.10	0.48	0.09	0.02	-	-	-	0.00	0.06	0.62	2.54	7.27
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	7.43	6.74	7.50	7.25	7.43	7.24	7.45	7.46	7.22	7.43	7.21	7.47	87.83
Pumps & Aux.	0.87	0.77	0.79	0.52	0.32	0.13	0.05	0.04	0.22	0.63	0.83	0.87	6.03
Ext. Usage	0.04	0.03	0.04	0.04	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.44
Misc. Equip.	7.82	7.11	7.92	7.66	7.84	7.66	7.87	7.89	7.63	7.84	7.61	7.87	92.72
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	9.01	8.28	9.32	9.00	9.09	9.00	9.16	9.24	8.92	9.09	8.84	9.16	108.10
Total	53.17	42.33	38.99	31.79	30.77	30.53	34.01	34.36	29.85	32.46	43.04	54.59	455.88

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	53.08	42.26	34.64	18.26	8.07	2.39	1.00	0.85	6.13	21.45	39.68	53.61	281.39
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	29.96	28.40	31.86	30.23	28.62	25.85	24.65	23.37	22.48	24.15	25.13	28.14	322.84
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	83.04	70.66	66.50	48.49	36.69	28.24	25.65	24.22	28.61	45.60	64.81	81.74	604.24

Figure 1 – Estimated Annual Energy End Use

BC hydro powersmart FORTIS BC™

Scenario Description

Pemberton Affordable Housing
Create New Worksheet
Copy to New Worksheet
Reset Current WorkSheet

Enhanced Thermal Performance Spread Sheet

IP Units (Change Units)

Clear Field Area Method

Select Area Calculation (Choose One)	Area	Units
◉ Sum of Active Clear Field Areas (Default)	26300.00	ft²
○ User Defined Area	Enter User Defined Opaque Area	ft²

Overall Opaque Wall Thermal Performance Values

Base Building		Proposed Building	
Opaque U-Value (BTU/hr ft²*F)	Enter Base Building U-Value	Opaque U-Value (BTU/hr ft²*F)	0.066
Effective R-Value (hr ft²*F/BTU)	-	Effective R-Value (hr ft²*F/BTU)	15.1

Proposed Building Entries

								Totals	1746.9	100%
Add/Remove Detail	Transmittance Type	Include	Transmittance Description	Area, Length or Amount Takeoff	Units	Transmittance Value	Units	Source Reference	Heat Flow (BTU/hr*F)	%Total Heat Flow
Add Clear Field	Clear Field	☑	2X6 Wood Frame with R22 batt plus 1in CI on exterior	26300.00	ft²	0.037	BTU/ hr ft² °F	8.1.5	960.0	55%
Remove Clear Field	Clear Field	☑	Enter Description Here	Enter Area Here	ft²	.0	BTU/ hr ft² °F	Enter Source Here	-	-
Add Linear Interface Detail	Linear Interface Detail	☑	Rim Joist	2628.00	ft	0.044	BTU/ hr ft °F	8.2.2	115.6	7%
Remove Linear Interface Detail	Linear Interface Detail	☑	Wall to Vinyl Window Intersection	6093.00	ft	0.032	BTU/ hr ft °F	8.3.1	195.0	11%
Remove Linear Interface Detail	Linear Interface Detail	☑	Wall to Roof Intersection	657.00	ft	0.032	BTU/ hr ft °F	8.4.1	21.0	1%
Remove Linear Interface Detail	Linear Interface Detail	☑	Wall Corner Intersection	3192.00	ft	0.020	BTU/ hr ft °F	8.5.1	63.8	4%
Remove Linear Interface Detail	Linear Interface Detail	☑	Parking Slab to Wall Intersection	657.00	ft	0.493	BTU/ hr ft °F	8.6.4	323.9	19%
Remove Linear Interface Detail	Linear Interface Detail	☑	Balcony to Wall Intersection	938.00	ft	0.072	BTU/ hr ft °F	8.2.3	67.5	4%

Figure 2 – Building Envelope Thermal Bridging Guide Result

BC Hydro Emissions Factor (kgCO2e/kWh)	0.011					
Natural Gas Emissions Factor (kgCOe/kWh)	0.185					
Corridor Pressurization Adjustment (kgCO2/sqm/yr)	1.85					
	Electricity Consumption (kWh)	Electricity Emissions (kgCO2e)	Natural Gas Consumption (Therm)	Natural Gas Emissions (kgCO2e)	Total Emissions (kgCO2e)	GHG Intensity (kgCO2/sqm/yr)
Proposed	558582.00	6144.40	5745.00	31140.77	37285.17	4.46
Adjusted GHG Intensity (kgCO2/sqm/yr)	**2.61**					

Figure 3 – Greenhouse Gas Intensity Calculation

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