



TLSE
Engineering



Integra ARCHITECTURE INC.



Crown Manor

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System features *(current state)*

Envelope	Wood framed 2x6 walls
Space Heating (suites)	Baseboard heating, central gas boiler
Space Heating (common areas, MUA)	Baseboard heating, central gas boiler
Cooling	None
Domestic Hot Water	Gas heating
Ventilation	No suite or corridor ventilation

Proposed approach

Component	Options			
Envelope	Stripping Recladding	Overcladding panelization	New windows/doors Triple pane U0.18 SHGC 0.3	Insulation 5.5" Roxul exterior wall 5" polyiso roof
Space Heating (in-suite)	Baseboards (low temp)	Heat Pump	High perf. Boiler/Furnace	
Space Heating (common areas)	Baseboards (low temp)	Heat Pump	High perf. Boiler/Furnace	
Cooling	Active – centralized (corridors)	Active-distributed (suites)	Passive (shading, cool roof and wall materials)	Common areas (MUA) In-suite
Domestic Hot Water	Resistance	Heat Pump	High eff gas	Heat capture
Ventilation	Distributed (Suite HRV)	Centralized (corridor)	HRV	ducted
Seismic	Synergistic	Collapse prevention	Life safety	Immediate occupancy
Electrical service upgrades	Sub-panel (...)	Main service (...)	Transformer (all elec service upgrades \$233k)	
Solar	Positive NPV	Rooftop PV 18.8 kW	Storage	

Vitals	
GHG	98% Savings -65.9 tCO2/yr
Energy	72% Savings -1,083 GJ/yr
NPV	-608 \$/m ² -\$1.6M
NPV <i>with incentives</i>	-569 \$/m ² -\$1.5M

Additional Features

Accessibility

Before



After

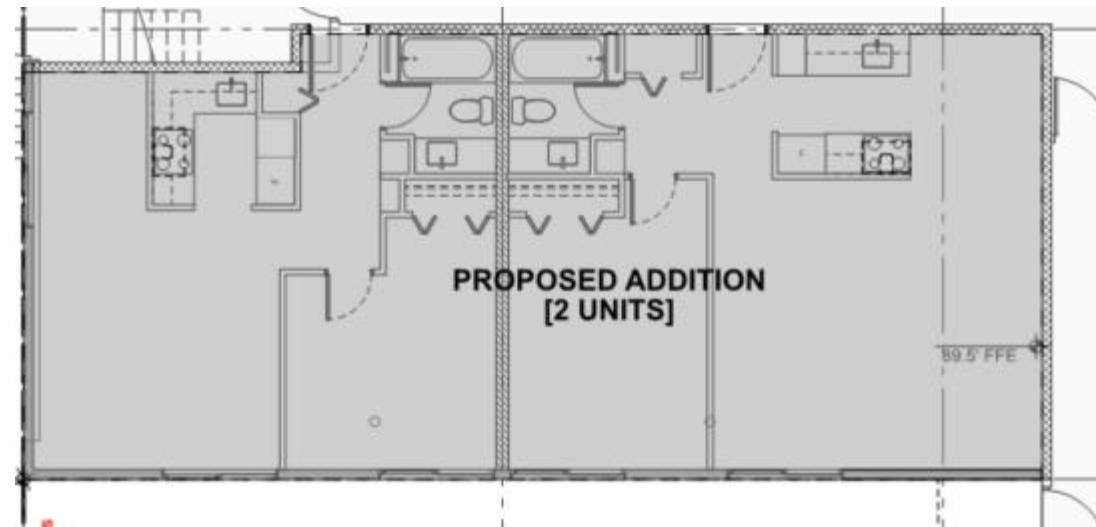


Added Suites

Before



After



Detailed Energy/GHG Results

	Existing Condition (Baseline A)	With BAU replacements due in next five years (Baseline B)	Proposed approach
GHGi (kg CO ₂ /m ² , % reduction)	27.4	21.3 (22%)	0.6 (98%)
TEUI (ekWh/m ² , % reduction)	182.8	145.4 (20%)	51.4 (72%)
Annual Energy cost (\$, % reduction)	\$24,520	\$21,168 (14%)	\$19,828 (19%)
Demand (KW) , % increase	20	18 (1% reduction)	80 (x4)
CEDI (kWh/m ₂)	0	0	11.7
TEDI (kwh/m ² , % reduction)	79.76	55.2 (31%)	15.2 (81%)
Hours over 80% acceptability w/passive measures (hours, % reduction)	Natural Ventilation: 1351	Natural Ventilation: 1697	Nat vent, shading, cool roof and walls 23 hours (penthouse only)

Detailed Financial Results

	Existing Conditions	Including required replacements in next five years	Schematic Design
Capital Cost	n/a	\$1.8M	\$4.1M
Renewal Amount (cost of business as usual replacements)	\$1.6M	\$1.6M	\$1.6M
Net Cost = Capital – Renewal Amount – Incentives, \$	n/a	\$200,000	\$2.07M
NPV without incentives (Net Cost, 40 years), \$	n/a	\$0.7M	-\$1.6M
NPV with incentives (Net Cost, 40 years), \$	n/a	\$0.7M	-\$1.5M
IRR (annual, with incentive), %	n/a	19%	-5%
NPV solar system	n/a	n/a	\$1,250

Incentives available:

BC Hydro, CleanBC Social Housing
Incentive Program
\$100,000

TOTAL : \$100,000

Other Options Considered

Component	Bundle 1 Minimal Capital Cost	Bundle 2 (proposed) Electrification and Envelope upgrades	Bundle 3 Electrification	Bundle 4 Gas Heat Pump, Envelope upgrades
Envelope	Walls R15.6 Windows U1.6 Doors R3.2 Roof R25 Foundation wall: no change	Doors – same as Bundle 1 Walls R23.8 Windows U1.0 Roof R30 Foundation wall R15	Walls, windows, doors same as Bundle 1 Roof R30	Windows, doors same as Bundle 1 Walls R20.8 Foundation wall R15 Roof R30
Space Heating (in-suite)	Low temperature baseboard			
Space Heating (suites and common areas)	Condensing gas boiler	ASHP Central HW heating	ASHP Central HW heating	Gas heat pump
Cooling	Mini split AC in Suites, ASHP in Corridor MUA			
Domestic Hot Water	ASHP Heating			
Ventilation	HRV for suites, ASHP for corridor MUA			
Seismic	Upgrades to meet code requirement: -enclose overhang parkade to create additional units, plywood sheathing, hold down rods			
Electrical Service upgrades	Required – sub panels, main service, transformer			

Legend	
	significantly less performant than proposed
	somewhat less performant than proposed
	significantly more performant than proposed
	slightly more performant than proposed
	components staying the same

Questions?

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Detailed Energy/GHG Results (all Bundles)

	With BAU replacements due in next five years (Baseline B)	Bundle 1: Minimize Capital Cost	Bundle 2: Envelope Upgrades	Bundle 3: Electrification	Bundle 4: Gas Heat pump, envelope upgrades	Proposed Bundle: (Bundle 2 with ASHP central heating)
GHGi (% reduction below historical (baseline A))	21.3 (22%)	9.66 (65%)	4.06 (85%)	0.92 (97%)	4.61 (83%)	0.6 (98%)
TEUI (% reduction below historical (baseline A))	145.4 (20%)	107 (41%)	76 (58%)	84 (54%)	79 (57%)	51.4 (72%)
Annual Energy cost (% reduction below historical (baseline A))	\$21,168 (14%)	\$26,212 (-7%)	\$23,656 (4%)	\$32,399 (-32%)	\$23,886 (3%)	\$19,828 (19%)
Demand (KW) (% reduction below historical (baseline A))	18 (10%)	55 (-175%)	55 (-175%)	110 (-450%)	55 (-175%)	80 (-300%)
CEDI (kWh/m ₂) (% reduction below historical (baseline A))	0	6.4	12.2	6.4	12.3	11.7
TEDI (% reduction below historical (baseline A))	55.2 (31%)	59.1 (26%)	21.9 (73%)	59.1 (26%)	27.1 (66%)	15.2 (81%)
Hours over 80% acceptability w/passive measures (% reduction below historical (baseline A))	Natural Ventilation: 1835	Shading, Cool Roof, Natural Ventilation: 23.75 (97%)	Shading, Cool Roof, Natural Ventilation: 24.75 (97%)	Shading, Cool Roof, Natural Ventilation: 24.25 (97%)	Shading, Cool Roof, Natural Ventilation: 22.75 (97%)	Cool Roof, Natural Ventilation: 23.75 (97%)

Detailed Financial Results (all Bundles)

	With BAU replacements due in next five years (Baseline B)	Bundle 1: Minimize Capital Cost	Bundle 2: Envelope Upgrades	Bundle 3: Electrification	Bundle 4: Gas Heat pump, envelope upgrades	Proposed Bundle: (Bundle 2 with ASHP central heating)
Capital Cost	\$1.8M	\$3.50M	\$3.71M	\$3.70M	\$3.77M	\$4.1
Renewal Amount	\$1.6M	\$1.6M	\$1.6M	\$1.6M	\$1.6M	\$1.6M
Incentives	-	\$222,403	\$235,082	\$222,403	\$230,499	\$100,000
Net Cost = Capital – Renewal Amount - Incentives	\$10,000	\$1.68M	\$1.87M	\$1.88M	\$1.94M	\$2.39M
NPV (Net Cost, 40 years)	\$0.7M	-\$1.08M	-\$1.16M	-\$1.46M	-\$1.23M	-\$1.46M
Energy cost reduction (\$, %)	\$21,168 (14%)	\$26,212 (-7%)	\$23,656 (4%)	\$32,399 (-32%)	\$23,886 (3%)	\$19,828 (19%)
Gap to Zero NPV (%)	n/a	31%	31%	40%	33%	35%
NPV with solar added	\$0.8M	-\$1.05M	-\$1.13M	-\$1.43M	-\$1.20M	n/a
IRR (if applicable)	19%					n/a