

# MAKING THE CASE FOR BUILDING TO ZERO CARBON

Canada Green Building Council®

**APPENDIX** 

# **NOTE**

This is the Appendix for the Making the Case for Building to Zero Carbon report that can be accessed separately <a href="here">here</a> or online at <a href="mailto:cagbc.org/MakingtheCase">cagbc.org/MakingtheCase</a>.

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# A-1 ARCHETYPE ASSUMPTIONS AND DETAILS

The modeling assumptions for each archetype, along with proposed improvements that form the ZCB packages, are described in detail below, along with a summary of the energy end-use breakdown by fuel of each archetype baseline and ZCB simulation. The following text provides details of how the archetypes were selected and modified for the study.

### ARCHETYPE SELECTION AND SITING

This study leveraged the work of National Resources Canada (NRCan), who developed models for each of the sixteen different Commercial Prototype Building Models developed by the US DOE¹. The table below shows all sixteen archetypes and highlights the ones selected / modified for this study.

Building Type Name	Floor Area (m²)	Number of Floors
Large Office	498,588	12
Medium Office	53,628	3
Small Office	5,500	1
Warehouse	52,045	1
Stand-alone Retail	24,962	1
Strip Mall	22,500	1
Primary School	73,960	1
Secondary School	210,887	2
Supermarket	45,000	1
Quick Service Restaurant	2,500	1
Full Service Restaurant	5,500	1
Hospital	241,351	5
Outpatient Health Care	40,946	3
Small Hotel	43,200	4
Large Hotel	122,120	6
Midrise Apartment	33,740	4

https://www.energy.gov/eere/buildings/commercial-reference-buildings

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To address the desire to include a larger and a smaller apartment building, the mid-rise archetype was stretched upward 6 floors (to 10) to create a second, larger MURB and the window to wall ratio was increased. The final summary of archetype descriptions are:

- Mid-rise Office: 500,000 ft² (46,350 m²), 12-storey office building with a window-to-wall area ratio of 40%. Such a large area over 12 storey results in a relatively deep floor plate.
- Low-rise Office: 53,620 ft² (4,982 m²), 3-storey roughly-square building with a window-to-wall ratio of 33%.
- Mid-rise Multi-Unit Residential Building (MURB): 84,350 ft<sup>2</sup> (7,830 m<sup>2</sup>), 10-storey building with window-to-wall ratio of 40%.
- Low-rise Multi-Unit Residential Building (MURB): 33,750 ft<sup>2</sup> (3,135 m<sup>2</sup>), 4-storey square building with 8 residential units and window-to-wall ratio of 20%.
- Big Box Retail (Retail): 24,689 ft<sup>2</sup> (2,294 m<sup>2</sup>) stand-alone, big-box style retail facility with a window-to-wall ratio of 7.2%.
- **Primary School (School):** 73,932 ft<sup>2</sup> (6,871 m<sup>2</sup>) 1-storey primary school with a window¬-to-wall ratio of 35%, heated and cooled year-round, which is representative of the average, but not all, educational buildings.
- Warehouse: 49,500 ft² (4,600 m²) 1-storey building. The building contains an office area that is 5% of the total area. The building has a window-to-wall ratio of less than 1% and 68 m² of skylights. The warehouse is heated and cooled to reflect the market-wide blend of heated-only, heated/cooled and refrigerated warehouse facilities.

The amount of area surrounding the building is also an important factor in this analysis. Based on patterns of urban development, the mid-rise office and residential archetypes are assumed to have a site area roughly equal to the building footprint, while the other archetypes assume a 2:1 site to building footprint ratio (recognizing the need for parking and a more sub-urban location). This means that the amount of site area available for renewable technologies like PV panels will be limited for tall buildings and they will need to rely more on procurements of renewable energy to achieve Zero Carbon.

#### **NECB 2011 BASELINE**

The 2011 version of the National Energy Code of Canada for Buildings (NECB 2011) was used to set up the reference buildings in this study, with HVAC configuration assumptions aligned with baseline generation work conducted by the National Research Council.

NECB 2011 provides minimum requirements for the design and construction of energy-efficient buildings and covers the building envelope, systems and equipment for heating, ventilating and air-conditioning, service water heating, lighting, and the provision of electrical power systems and motors. It applies to new buildings and additions.

The intention for the reference buildings was to have HVAC system configurations set up independently of any specific proposed design; an approach that is a departure from the normal NECB system selection process. To better align with typical industry practice (i.e. for more accurate costing), in some cases design assumptions were made that do not directly fit the NECB 2011 baseline requirements. For example:

- The large office is assumed to be served by compartment units on each floor, which receive ventilation from a central MAU (instead of self-contained VAV units for each floor with independent OA intakes).
- The school is assumed to have packaged VAV systems serving multiple zones, instead of numerous packaged single zone systems as prescribed by NECB 2011.
- Ventilation effectiveness of 0.5 is assumed for MURBs where corridor pressurization is used to satisfy OA requirements for suites, while the suites have FCUs with hydronic heating and small split DX cooling (to align with NECB).





The NECB also prescribes different levels of envelope performance depending on the climate zone. To simplify the cost analysis, all baseline archetypes regardless of climate zone are based on the Toronto requirements. This means that baseline costs for colder regions are underestimated while those for warmer regions are overestimated. The opposite is true for the cost of the ZCB scenarios.

The table below provides the regional requirements of the NECB-2011.

	HDD18	CDD10	Glazing Area	Glazing U-value	Wall R-value	Roof R-value
Vancouver	2825	853	40%	U-0.42	R-18	R-25
Calgary	500	648	33%	U-0.39	R-27	R-35
Toronto	3520	1317	40%	U-0.39	R-20.4	R-31
Ottawa	4440	1136	37%	U-0.39	R-23	R-31
Montreal	4200	1192	39%	U-0.39	R-23	R-31
Halifax	4000	813	40%	U-0.39	R-23	R-31

Design Days in each location represent the peak outdoor conditions that an HVAC system should be designed to accommodate, while maintaining desired indoor conditions. Standard Design Day values from ASHRAE are shown below:

	Jan	uary	July	2.5%
	2.5%	1%	Dry-bulb	Wet-bulb
Vancouver	-7	-9	28	20
Calgary	-30	-32	28	17
Toronto	-18	-20	31	23
Ottawa	-25	-27	30	23
Montreal	-23	-26	30	23
Halifax	-16	-18	26	20

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#### **ARCHETYPES IN PRACTICE**

The archetype approach is commonly used for large whole-sector studies such as this, as well as Energy Code comparisons (Provincial Authorities use this approach to update building code cycles). While the approach reduces complexity and effort, it introduces several limitations discussed below.

**Energy Codes differ across Canada:** The study uses the NECB 2011 as the baseline level of performance and cost. This means that in jurisdictions that have more stringent energy codes, such as BC, ON, Vancouver and Toronto, the baseline construction cost is underestimated, while the cost to achieve ZCB is inflated. Similar studies have been done by Toronto<sup>2</sup> and BC<sup>3</sup> which are useful references to understand specifics in these locations.

Market rate buildings differ from archetypes: There are always differences between an archetype and any specific project, but this difference is exaggerated for the mid-rise office and mid-rise MURB buildings which can be significantly taller in most cities, particularly in Toronto and Vancouver. This size difference affects the costing analysis since the surface to volume ratios differ, with the largest impact on envelope costs. Taller buildings have less roof area per volume (and corresponding energy demand), which can limit capacity for deployment of renewables, and make it more difficult to achieve a zero carbon balance. Further study of tall buildings (i.e. above 20 storeys) is warranted for those seeking to align the results of this study with such buildings.

Actual baseline envelope performance can be significantly worse than modeled: The skylines of most Canadian cities are dotted with highly-glazed curtainwall and window-wall clad office and residential towers. An exceedingly small number of these buildings achieve the level of envelope thermal performance prescribed by the NECB and used in the archetypes. For example, the NECB Toronto mid-rise MURB has an area-weighted whole-wall R-value of 5.4 (based on 40% glazing, window U-value of 0.39 and opaque wall R-value of 20). By comparison, a typical market rate condo with 60% double-glazing and conventional curtainwall (which is a poor-performing cladding system due to large thermal breaks) achieves a whole-wall R-value of only 3.4, a reduction of almost 40%. This means that the baseline cost for the office and MURB archetypes to achieve the prescribed performance (i.e. R-5.4) is underestimated. In WSP's experience, the combined savings of going to a 40% window to wall ratio and cost of achieving a true R-10 to R-15 overall can cancel each other out. The savings on windows pay for the improved thermal performance of the enclosure. This assertion is not universally true, but is assumed to hold for this study where we have not explored window to wall ratios beyond 40%.

Regardless of current design practices and approaches, stringent new energy codes in jurisdictions like Toronto and Vancouver, as well as updates in the newest versions of the NECB and ASHRAE 90.1, have strict requirements for envelope performance. These changes will begin to close the gap between market and archetype envelope performance.

**Functional programs can vary greatly:** Minor variations in floor area, massing, functional program and actual operations are understandably typical of these studies, but some functional program differences can be very large. Examples include pools in schools and residential buildings, data centres in office buildings, speciality lighting in retail and process loads in warehouses. All of these fairly common loads and systems tend to increase energy use (e.g. a data centre's energy intensity can be 100x higher than a typical office space). This means that the raw costs to achieve ZCB for buildings with unique energy-intensive equipment will be underestimated. That said, such equipment may be a source of heat that can be used to balance heat loss throughout the facility and improve the cost and effectiveness of geo-exchange systems.

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#### ALTERNATE DESIGNS FOR RETAIL AND WAREHOUSE

The same carbon reduction measures were applied to all archetypes. Further refinements were necessary for retail and warehouses to ensure the carbon reduction measures were appropriate for these archetypes. Specifically, the window, heating/cooling delivery, and fuel switching bundles were removed and the amount of onsite solar photovoltaics (PV) was increased to take greater advantage of the roof space available. These modifications significantly decreased the incremental capital and lifecycle costs of the ZCB designs and are better aligned with the approach likely to be seen in the market.

<sup>&</sup>lt;sup>2</sup> https://www.toronto.ca/wp-content/uploads/2017/11/9875-Zero-Emissions-Buildings-Framework-Report.pdf

https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/construction-industry/building-codes-and-standards/reports/bc\_energy\_step\_code

#### Mid-Rise Office Archetype

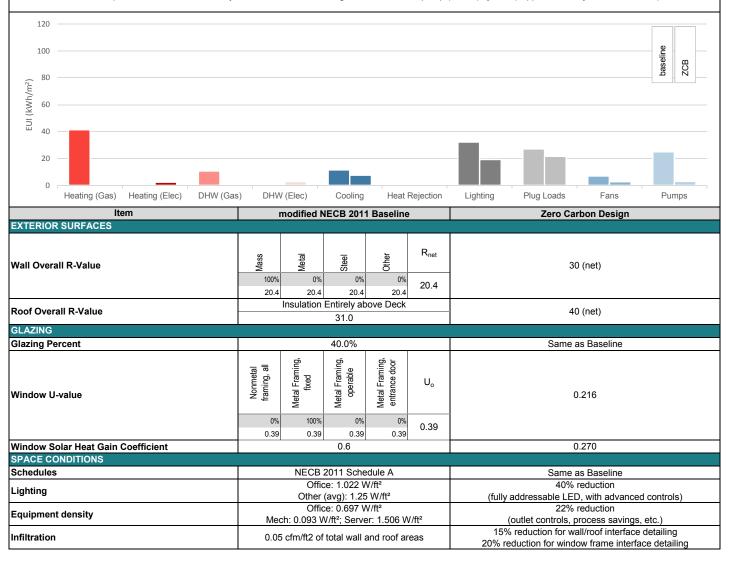
**Key Building Characteristics** 



The mid-rise office archetype represents a rectangle 500,000 ft² (46,450 m²), 12-storey building with a wall-to-roof area ratio of 3.25. The window-to-wall area ratio is 40%. The exterior façade is comprised of curtain wall, with continuous interior insulation on the inboard side of metal spandrel panel assemblies. There is one below-grade level containing mechanical and back-of-house spaces, as well as 1 unconditioned parking level. Each floor is divided into 6 zones, and 3 space types, including office, M&E spaces, and core&support spaces. A set of 4 elevators and 2 exit stairwells serve the building access and egress requirements.

BASELINE HVAC: The HVAC system includes 13 built-up variable air volume (VAV) compartment systems with hydronic heating and cooling, serving each floor. Ventilation is provided to each compartment unit by a central make-up air unit on the roof. Two natural gas boiler provides heating. Two water-cooled scroll chiller provides cooling. One open cooling tower cools the chiller condensers.

ZERO CARBON DESIGN: Involves a higher performance envelope than the baseline design, reduced internal loads and design considerations for roof mounted PV. Mechanically, this package involves separating perimeter and core systems, using a dedicated outdoor air system, ventilation delivered through an underfloor system (with occupancy sensor control), and includes radiant heating/cooling for perimeter zones. This package also further improves exhaust heat recovery, and introduces a central ground source heat pump (GSHP) system (supplemented by a biomass boiler).



#### Mid-Rise Office Archetype

HVAC SYSTEM TYPE		
Air Handling	13 built-up VAV systems with reheat	Central DOAS serving perimeter zones Central VAV serving core zones
Principle Heating Fuel Type	Natural Gas	Electricity - GSHP Radiant heating loops for perimeter zones
Cooling Source	Water cooled chiller and cooling tower	Electricity - GSHP Radiant cooling loops for perimeter zones
Supply Air Temperature Control	Cooling: 13°C (55°F) Heating: 35°C (95°F) Control: warmest; reset priority: airflow first	Cooling: 16°C (60°F) with reset Heating: tempered OA with radiant heating
Fan Power	Supply/Return fan: Total static (inches water gauge):4/1 Total efficiency: 0.55/0.3	DOAS supply/return Total static (inches water gauge): 3/1 Total efficiency: equal to baseline Multiple fan configuration (min flow: 10%) Fans/ductwork oversized by 30%
Outside Air	Variable supply of OA	Underfloor ventilation with DCV Ev/Ez: 1.0/1.2
Fan Curve (VAV only)	VFD on all systems	VFD on all systems
Energy Recovery	None	90% energy recovery effectiveness
HVAC CONTROL		
Heating and Cooling Setpoints	Heating: 22°C (72°F) Cooling: 24°C (75°F)	Heating: 22°C (72°F) Cooling: 24°C (75°F)
Economizer	Dual Temperature	capable of 100% OA mode; dual enthalpy w/ ERV bypass
HEATING PLANT		
Central Heating Efficiency	1 modulating boilers (down to 25% capacity): 83.3% rated efficiency	Central ground source heat pumps providing heating Heating COP: 3.2 Supplemented by a biomass boiler
Hot Water Temperature	82°C - Δ 17°C (180°F - Δ 30°F)	54°C - Δ 17°C (130°F - Δ 30°F)
Hot Water Flow	Single speed primary-only pumping	variable speed pumping
COOLING PLANT		
Central Cooling Efficiency	2 water-cooled centrifugal chiller: 5.67 COP	Central ground source heat pumps providing cooling Cooling COP: 5.8
Chilled Water Temperature	7°C - Δ 6°C (44°F - Δ 11°F)	7°C - Δ 6°C (44°F - Δ 11°F)
Chilled Water Flow	Single speed primary-only pumping	variable speed pumping
Cooling Tower	1 cooling tower (1 cell, single speed fan):	1 fluid cooler to supplement geo-exchange field during peak
DOMESTIC HOT WATER (DHW)		
Heating Efficiency	1 natural gas DHW tank heater: 80%	Heat Pump COP: 3.0
Avg. Load (GPM)	13.6	34% reduction (ultra low-flow fixtures)
ONSITE RENEWABLE ENERGY		

#### Low-Rise Office Archetype

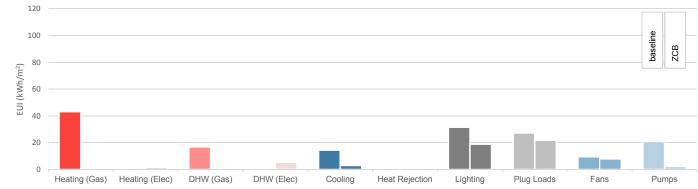
**Key Building Characteristics** 



The low-rise office archetype represents a 53,620 ft² (4,982 m²), 3-storey core & shell building with a wall-to-roof area ratio of 1.2. The window-to-wall area ratio is 33%. The exterior façade is comprised of curtain wall, with continuous interior insulation on the inboard side of metal spandrel panel assemblies. Each floor is divided into 5 zones, and 2 space types, including office and core & support spaces. A set of 2 elevators and 2 exit stairwells serve the building access and egress requirements.

BASELINE HVAC: The HVAC system includes 3 rooftop built-up variable air volume (VAV) units with hydronic heating and cooling, serving each floor. One natural gas boiler provides heating. One water-cooled scroll chiller provide cooling. One open cooling tower cools the chiller condensers.

ZERO CARBON DESIGN: This package involves a higher performance envelope than the baseline design, reduced internal loads and design considerations for PV (both roof-mounted and site). Mechanically, it introduces the use of a dedicated outdoor air system (DOAS), ventilation delivered through an underfloor system (with occupancy sensor control), and variable refrigerant flow (VRF) heating/cooling connected to a central geoexchange field. This package also further improves exhaust heat recovery. Lighting will incorporate directly addressable LED fixtures tied to occupancy sensors that provide advanced, fine-tuned control over light levels in areas where occupant activity is occurring.



0									
Heating (Gas) Heating (Elec) DHW (	Gas) DHW	/ (Elec)	Cooling	Heat F	Rejection	Lighting	Plug Loads	Fans	Pumps
Item		nodified N	IECB 2011	Baseline	!		Zero Car	bon Design	
EXTERIOR SURFACES									
Wall Overall R-Value	88 ₩ 100% 20.4	© 0% 0% 20.4	© 0% 20.4	0th 0% 20.4	20.4		30	(net)	
Roof Overall R-Value		Insulation	Entirely ab 31.0	ove Deck			40	(net)	
GLAZING									
Glazing Percent			33.0%				Same a	s Baseline	
Window U-value	Nonmetal framing, all	Metal Framing, fixed	Metal Framing, operable	Metal Framing, entrance door	U <sub>o</sub>		0.	216	
	0%	100% 0.39	0% 0.39	0% 0.39	0.39				
Window Solar Heat Gain Coefficient			0.6				0.	.270	
SPACE CONDITIONS									
Schedules		NECB :	2011 Sche	dule A			Same a	s Baseline	
Lighting			ce: 1.022 W er: 1.25 W			(fully	40% r addressable LED	eduction , with advanced	controls)
Equipment density	Med		ce: 0.697 W V/ft²; Serve		//ft²		22% r (outlet controls, pr	eduction ocess savings, e	etc.)
Infiltration	0.05	cfm/ft2 of	total wall a	and roof ar	eas	50% v	vhole-enclosure re	eduction interface	e detailing

#### Low-Rise Office Archetype

Air Handling  3 bull-up VAV systems with reheat Principle Heating Fuel Type  Natural Gas Boiler  Cooling Source  Water-cooled driller and cooling tower Cooling: 13°C (55°F) Reset: 18°C at OAT 16°C; 13°C at OAT 2°C (65°F at OAT 60°F; 55°F at OAT 6	HVAC SYSTEM TYPE		
Principle Heating Fuel Type	Air Handling	3 built-up VAV systems with reheat	Central DOAS
Cooling Source   Water-cooled chiller and cooling tower   Cooling: 327 (55°F)     Cooling: 327 (55°F)     Heating: 43°C (109°F)     Reset: 18°C (400°F)     Rest: 18°C		, ,	
Cooling: 13°C (55°F)		Water-cooled chiller and cooling tower	
Fan Power  Supply/Return fan: Total static (inches water gauge):3/1 Total efficiency: equal to baseline Multiple fan configuration (min flow: 10%) Fans/ductwork oversized by 30%  VRF terminals: 0.000193 kW/cfm  Outside Air  Variable supply of OA Ev/Ez: 0.8/1.0  Ev/Ez: 0.8/1.0  VFD  VFD  VFD  VFD  Heating: 22°C (72°F) Cooling: 24°C (72°F) Cooling: 24°C (75°F) Contral Heating: 22°C (72°F) Cooling: 24°C (75°F) Cooling: 24°C (75°F) Dual enthalpy bypass of ERV  HEATINO PLANT  Central Heating: Efficiency Hot Water Flow Single speed primary-only pumping  COLING PLANT  Central Cooling Efficiency  1 water-cooled reciprocating chiller: Cooling: 54°C OP 3.0  Single speed primary-only pumping Variable speed pumping  Cooling Temperature  7°C - Δ 6°C (44°F - 3.11°F) Ground Gop variable speed pumping  Cooling Tower  1 not cooling tower (1 cell, single speed fan): Note Total static (inches water gauge):3/1  Nutle efficiency  Avg. Load (GPM)  ONSITE RENEWABLE ENERGY	Supply Air Temperature Control	Heating: 43°C (109°F) Reset: 18°C at OAT 16°C; 13°C at OAT 27°C	Cooling: 16°C (60°F)
Outside Air         Variable supply of OA EV/Ez: 0.8/1.0         Underfloor ventilation with DCV EV/Ez: 1.0/1.2           Fan Curve (VAV only)         VFD         VFD           Energy Recovery         None         75% energy recovery effectiveness           Heating and Cooling Setpoints         Heating: 22°C (72°F) Cooling: 24°C (75°F)         Heating: 22°C (72°F) Cooling: 24°C (75°F)           Economizer         OA Temp, drybulb high limit: 18°C (65°F)         Dual enthalpy bypass of ERV           HEATING PLANT         1 modulating boiler (down to 25% capacity): 83% rated efficiency         Water-source VRF connected to ground loop COP 5.9 in heating           Hot Water Temperature         82°C - Δ 17°C (180°F - Δ 30°F)         ground loop varies seasonally           Hot Water Flow         Single speed primary-only pumping         variable speed pumping           COOLING PLANT         1 water-cooled reciprocating chiller: 3.54 COP         Water-source VRF connected to ground loop COP 5.0 in cooling           Chilled Water Temperature         7°C - Δ 6°C (44°F - Δ 11°F)         ground loop varies seasonally           Chilled Water Flow         Single speed primary-only pumping         variable speed pumping           Coling Tower         1 cooling tower (1 cell, single speed fan):         not installed           DOMESTIC HOT WATER (DHW)         1 natural gas DHW tank heater: 81%         Heat pump: COP 3.0           Avg. Load	Fan Power	Total static (inches water gauge):4/1	Total static (inches water gauge):3/1 Total efficiency: equal to baseline Multiple fan configuration (min flow: 10%) Fans/ductwork oversized by 30%
EVIEz: 0.87.0 EVIEZ: 0.10.1.2 Fan Curve (VAV only)  Fan Curve (VAV	0.444.44	Variable supply of OA	
Energy Recovery         None         75% energy recovery effectiveness           HVAC CONTROL         Heating: 22°C (72°F)         Cooling: 24°C (75°F)         Cooling: 24°C (75°F)           Economizer         OA Temp. drybulb high limit: 18°C (65°F)         Dual enthalpy bypass of ERV           HEATING PLANT         Todulating boiler (down to 25% capacity): 83% rated efficiency         Water-source VRF connected to ground loop COP 5.9 in heating           Hot Water Temperature         82°C - Δ17°C (180°F - Δ30°F)         ground loop varies seasonally           Hot Water Flow         Single speed primary-only pumping         variable speed pumping           COOLING PLANT         1 water-cooled reciprocating chiller: 3.54 COP         Water-source VRF connected to ground loop COP 5.0 in cooling           Central Cooling Efficiency         1 water-cooled reciprocating chiller: 3.54 COP         Water-source VRF connected to ground loop COP 5.0 in cooling           Chilled Water Temperature         7° C - Δ6°C (44°F - Δ11°F)         ground loop varies seasonally           Chilled Water Flow         Single speed primary-only pumping         variable speed pumping           Cooling Tower         1 cooling tower (1 cell, single speed fan):         not installed           DOMESTIC HOT WATER (DHW)         1 natural gas DHW tank heater: 81%         Heat pump: COP 3.0           Avg. Load (GPM)         1.9         34% reduction (ultra low-flow fixtures) </th <th>Outside Air</th> <th></th> <th>Ev/Ez: 1.0/1.2</th>	Outside Air		Ev/Ez: 1.0/1.2
HVAC CONTROL  Heating and Cooling Setpoints  Cooling: 24°C (72°F) Cooling: 24°C (75°F)  Economizer  HEATING PLANT  Central Heating Efficiency  1 modulating boiler (down to 25% capacity): 83% rated efficiency COP 5.9 in heating COP 5.9 in heating Flow Single speed primary-only pumping COOLING PLANT  Central Cooling Efficiency  1 water-cooled reciprocating chiller: 3.54 COP 3.54 COP COP 5.0 in cooling Chilled Water Temperature 7°C - ∆ 6°C (44°F - ∆ 11°F) ground loop varies seasonally Colling Tower  Cooling Tower  1 cooling tower (1 cell, single speed fan):  1 natural gas DHW tank heater: 81% COP 3.0 Avg. Load (GPM)  National Set Core (12°F) Cooling Set Cooling 22°C (72°F) Cooling: 24°C (75°F) Cooling: 24°C (45°F) Cooling: 24°C (25°F) Cooling: 24°C (25°F) Cooling: 24°C (75°F) C	Fan Curve (VAV only)	VFD	VFD
Heating and Cooling Setpoints    Heating: 22°C (72°F)		None	75% energy recovery effectiveness
Heating and Cooling Setpoints  Cooling: 24°C (75°F)  Cooling: 24°C (75°F)  Cooling: 24°C (75°F)  Economizer  OA Temp, drybulb high limit: 18°C (65°F)  Dual enthalpy bypass of ERV  HEATING PLANT  Central Heating Efficiency  I modulating boiler (down to 25% capacity): 83% rated efficiency  rated efficiency  B2°C - ∆ 17°C (180°F - ∆ 30°F)  ground loop varies seasonally  Hot Water Flow  Single speed primary-only pumping  COOLING PLANT  Central Cooling Efficiency  I water-cooled reciprocating chiller:  OA Temp, drybulb high limit: 18°C (65°F)  Dual enthalpy bypass of ERV  Water-source VRF connected to ground loop varies seasonally  Variable speed pumping  COP 5.0 in cooling  Chilled Water Temperature  T°C - ∆ 6°C (44°F - ∆ 11°F)  Ground loop varies seasonally  Chilled Water Flow  Single speed primary-only pumping  Variable speed pumping  Cooling Tower  I cooling tower (1 cell, single speed fan):  DOMESTIC HOT WATER (DHW)  Heating Efficiency  1 natural gas DHW tank heater:  81%  Avg. Load (GPM)  1.9  ONSITE RENEWABLE ENERGY	HVAC CONTROL		
HEATING PLANT  Central Heating Efficiency  I modulating boiler (down to 25% capacity): 83% rated efficiency  Rated efficiency  B2°C - △ 17°C (180°F - △ 30°F)  Single speed primary-only pumping  COOLING PLANT  Central Cooling Efficiency  I water-cooled reciprocating chiller: 3.54 COP  Chilled Water Temperature  7°C - △ 6°C (44°F - △ 11°F)  Chilled Water Flow  Single speed primary-only pumping  Cooling Tower  1 cooling tower (1 cell, single speed fan):  1 natural gas DHW tank heater: 81%  Avg. Load (GPM)  1 modulating boiler (down to 25% capacity): 83%  Water-source VRF connected to ground loop variable speed pumping  Water-source VRF connected to ground loop COP 5.0 in cooling  Cooling Tower  1 cooling tower (1 cell, single speed fan):  1 natural gas DHW tank heater: 81%  COP 3.0  34% reduction (ultra low-flow fixtures)  ONSITE RENEWABLE ENERGY	Heating and Cooling Setpoints	S ( ,	
Central Heating Efficiency       1 modulating boiler (down to 25% capacity): 83% rated efficiency       Water-source VRF connected to ground loop COP 5.9 in heating         Hot Water Temperature       82°C - Δ 17°C (180°F - Δ 30°F)       ground loop varies seasonally         Hot Water Flow       Single speed primary-only pumping       variable speed pumping         COOLING PLANT       Vater-source VRF connected to ground loop         Central Cooling Efficiency       1 water-cooled reciprocating chiller: S.54 COP       Water-source VRF connected to ground loop         Chilled Water Temperature       7°C - Δ 6°C (44°F - Δ 11°F)       ground loop varies seasonally         Chilled Water Flow       Single speed primary-only pumping       variable speed pumping         Cooling Tower       1 cooling tower (1 cell, single speed fan):       not installed         DOMESTIC HOT WATER (DHW)       1 natural gas DHW tank heater: B1%       Heat pump: COP 3.0         Avg. Load (GPM)       1.9       34% reduction (ultra low-flow fixtures)         ONSITE RENEWABLE ENERGY	Economizer	OA Temp, drybulb high limit: 18°C (65°F)	Dual enthalpy bypass of ERV
Central Heating Efficiency       COP 5.9 in heating         Hot Water Temperature       82°C - Δ 17°C (180°F - Δ 30°F)       ground loop varies seasonally         Hot Water Flow       Single speed primary-only pumping       variable speed pumping         COOLING PLANT       Water-source VRF connected to ground loop         Central Cooling Efficiency       1 water-cooled reciprocating chiller:       Water-source VRF connected to ground loop         CoP 5.0 in cooling       COP 5.0 in cooling         Chilled Water Temperature       7°C - Δ 6°C (44°F - Δ 11°F)       ground loop varies seasonally         Chilled Water Flow       Single speed primary-only pumping       variable speed pumping         Cooling Tower       1 cooling tower (1 cell, single speed fan):       not installed         DOMESTIC HOT WATER (DHW)         Heating Efficiency       1 natural gas DHW tank heater:       Heat pump:         COP 3.0       34% reduction         Avg. Load (GPM)       1.9       34% reduction         ONSITE RENEWABLE ENERGY	HEATING PLANT		
Hot Water Flow       Single speed primary-only pumping       variable speed pumping         COOLING PLANT       1 water-cooled reciprocating chiller: 3.54 COP       Water-source VRF connected to ground loop COP 5.0 in cooling         Chilled Water Temperature       7°C - Δ 6°C (44°F - Δ 11°F)       ground loop varies seasonally         Chilled Water Flow       Single speed primary-only pumping       variable speed pumping         Cooling Tower       1 cooling tower (1 cell, single speed fan):       not installed         DOMESTIC HOT WATER (DHW)       1 natural gas DHW tank heater: 81%       Heat pump: COP 3.0         Avg. Load (GPM)       1.9       34% reduction (ultra low-flow fixtures)         ONSITE RENEWABLE ENERGY	Central Heating Efficiency		
Cooling FLANT  Central Cooling Efficiency  1 water-cooled reciprocating chiller: 3.54 COP COP 5.0 in cooling Chilled Water Temperature  7°C - \( \Delta \) 6°C (44°F - \( \Delta \) 11°F) ground loop varies seasonally Chilled Water Flow Single speed primary-only pumping variable speed pumping  Cooling Tower  1 cooling tower (1 cell, single speed fan):  DOMESTIC HOT WATER (DHW)  Heating Efficiency  1 natural gas DHW tank heater: 81% COP 3.0  Avg. Load (GPM)  1.9  Water-source VRF connected to ground loop COP 5.0 in cooling Variable seasonally variable speed pumping Varia	Hot Water Temperature	82°C - Δ 17°C (180°F - Δ 30°F)	ground loop varies seasonally
Central Cooling Efficiency  1 water-cooled reciprocating chiller: 3.54 COP COP 5.0 in cooling Chilled Water Temperature  7°C - \( \Delta \) 6°C (44°F - \( \Delta \) 11°F) Ground loop varies seasonally Chilled Water Flow Single speed primary-only pumping Variable speed pumping  Cooling Tower  1 cooling tower (1 cell, single speed fan):  DOMESTIC HOT WATER (DHW) Heating Efficiency  1 natural gas DHW tank heater: 81% COP 3.0  Avg. Load (GPM)  1.9  Water-source VRF connected to ground loop COP 5.0 in cooling Variable speed pumping Variable speed pum	Hot Water Flow	Single speed primary-only pumping	variable speed pumping
Central Cooling Efficiency       3.54 COP       COP 5.0 in cooling         Chilled Water Temperature       7°C - Δ 6°C (44°F - Δ 11°F)       ground loop varies seasonally         Chilled Water Flow       Single speed primary-only pumping       variable speed pumping         Cooling Tower       1 cooling tower (1 cell, single speed fan):       not installed         DOMESTIC HOT WATER (DHW)       1 natural gas DHW tank heater:       Heat pump:         81%       COP 3.0         Avg. Load (GPM)       1.9       34% reduction (ultra low-flow fixtures)         ONSITE RENEWABLE ENERGY	COOLING PLANT		
Chilled Water Flow     Single speed primary-only pumping     variable speed pumping       Cooling Tower     1 cooling tower (1 cell, single speed fan):     not installed       DOMESTIC HOT WATER (DHW)     1 natural gas DHW tank heater:     Heat pump:       81%     COP 3.0       Avg. Load (GPM)     1.9     34% reduction (ultra low-flow fixtures)       ONSITE RENEWABLE ENERGY	Central Cooling Efficiency		• •
Cooling Tower 1 cooling tower (1 cell, single speed fan): not installed  DOMESTIC HOT WATER (DHW)  Heating Efficiency 1 natural gas DHW tank heater: Heat pump: COP 3.0  Avg. Load (GPM) 1.9 34% reduction (ultra low-flow fixtures)	Chilled Water Temperature	7°C - Δ 6°C (44°F - Δ 11°F)	ground loop varies seasonally
DOMESTIC HOT WATER (DHW)  Heating Efficiency  1 natural gas DHW tank heater: 81%  COP 3.0  Avg. Load (GPM)  1.9  34% reduction (ultra low-flow fixtures)  ONSITE RENEWABLE ENERGY	Chilled Water Flow	Single speed primary-only pumping	variable speed pumping
Heating Efficiency  1 natural gas DHW tank heater: 81%  COP 3.0  Avg. Load (GPM)  1.9  1.9  COP 3.0  Avg. Load (GPM)  ONSITE RENEWABLE ENERGY	Cooling Tower	1 cooling tower (1 cell, single speed fan):	not installed
Heating Efficiency  81%  COP 3.0  Avg. Load (GPM)  1.9  34% reduction (ultra low-flow fixtures)  ONSITE RENEWABLE ENERGY	DOMESTIC HOT WATER (DHW)		
Avg. Load (GPM)  ONSITE RENEWABLE ENERGY  (ultra low-flow fixtures)	Heating Efficiency	<u> </u>	
	Avg. Load (GPM)	1.9	
Photovoltaic panels (available area) - 80% of roof area and a portion of site area (200 m²)	ONSITE RENEWABLE ENERGY		
	Photovoltaic panels (available area)	-	80% of roof area and a portion of site area (200 m²)

#### Mid-Rise MURB Archetype

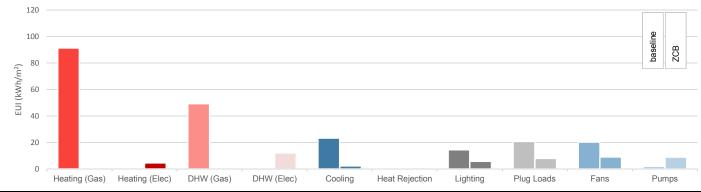
**Key Building Characteristics** 



The mid-rise MURB archetype represents an 84,350 ft² (7,830 m²), 10-storey building with a wall-to-roof area ratio of 4.9. The window-to-wall area ratio is 40%. The exterior façade is comprised of window wall, with continuous interior insulation on the inboard side of metal spandrel panel assemblies. The zoning includes 8 apartments and 1 core zone per floor. There are 2 levels of unconditioned below-grade parking. A set of 4 elevators and 2 exit stairwells serve the building access and egress requirements.

BASELINE HVAC: The suites are served by fan coil units (FCUs) with hydronic heating coils and direct expansion (DX) cooling (through the wall). A central make-up air unit (MAU) unit provides 100% outdoor air (OA) to the core zones, and into the suites via door undercuts. The central make-up air unit (MAU) will be located on the roof and will include hydronic heating coil and DX cooling coil. Envelope losses in corridors will be handled by hydronic perimeter baseboards. Two natural gas boilers serve the hydronic heating loop.

ZERO CARBON DESIGN: Involves a higher performance envelope than the baseline design, reduced internal loads and design considerations for roof mounted PV. Mechanically, this package involves a centralized air distribution system with zone-level ventilation control, as well as incorporating variable refrigerant flow (VRF) for heating/cooling delivery. This package also further incorporates central exhaust heat recovery, and introduces a central ground source heat pump (GSHP) system (supplemented by a biomass boiler).



_							_		
0 Heating (Gas) Heating (Elec) DHW (Ga	as) DHV	V (Elec)	Cooling	Heat	Rejection	Lighting	Plug Loads	Fans	Pumps
Item		modified N	NECB 2011	1 Baseline			Zero Carb	on Design	
EXTERIOR SURFACES									
Wall Overall R-Value	88 W 100%	Metal %	Steel Steel	Other %	R <sub>net</sub>		30 (	(net)	
	20.4	20.4	20.4	20.4	20.4				
Roof Overall R-Value		Insulation	Entirely ab 31.0	ove Deck			40 (	(net)	
GLAZING									
Glazing Percent			40.0%				Same as	Baseline	
Window U-value	Nonmetal framing, all	Metal Framing, fixed	Metal Framing, operable	Metal Framing, entrance door	U <sub>o</sub>		0.2	216	
	0%	100%	0%	0%	0.39				
	0.39	0.39	0.39	0.39	0.59				
Window Solar Heat Gain Coefficient			0.6				0.2	270	
SPACE CONDITIONS									
Schedules			2011 Sche				Same as	Baseline	
Lighting		0.49	95 W/ft² (a	vg)			40% reduction (	LED & control	s)
Equipment density		0.4	65 W/ft² (a	vg)		25% reduction		liances and pr ngs)	ocess equipment
Infiltration	0.05	cfm/ft2 of	total wall a	and roof ar	eas		eduction for wall uction for windov		•

#### Mid-Rise MURB Archetype

HVAC SYSTEM TYPE		
Air Handling	Central MAU serving corridors FCUs for suite space conditioning	Central DOAS
Principle Heating Fuel Type	Natural gas boiler serving hydronic coils in FCU and MAU, and baseboards (non-suite perimeter)	Electricity - water-cooled VRF connected to geo-exchange
Cooling Source	DX cooling for MAU, and DX coils in the FCUs (split condenser for each unit)	Electricity - water-cooled VRF connected to geo-exchange
Supply Air Temperature Control	MAU Cooling/Heating: 21°C/24°C (70°F/75°F) FCUs Cooling/Heating: 16°C/38°C (60°F/100°F)	Cooling: 16°C (60°F) Heating: 38°C (100°F)
Fan Power	MAU Supply/Return fan: Total Static (inches Water Gauge): 3/1 Total Efficiency: 0.55	MAU Supply/Return fan: Total Static (inches Water Gauge): 3/1 Total Efficiency: 0.55
	Suite unit fan: 0.0003 kW/cfm	VRF terminal unit: 0.000193 kW/cfm
Outside Air	OA supply through corridor pressurization 0.5 ventilation effectiveness	Direct-ducted OA supply 1.0 ventilation effectivenss
Fan Curve (VAV only)	MAU constant volume FCUs cycling	VFD for DOAS terminal units have ECM fans with low-speed during heating and float hours
Energy Recovery	None	90% energy recovery effectiveness
HVAC CONTROL		
Heating and Cooling Setpoints	Heating: 22°C (72°F) Cooling: 24°C (75°F)	Heating: 22°C (72°F) Cooling: 24°C (75°F)
Economizer	Dual Temperature	Dual Enthalpy
HEATING PLANT		
Central Heating Efficiency	1 modulating boilers (down to 25% capacity): 83% rated efficiency	water-source VRF connected to central ground loop COP 5.9 in heating supplemented by a biomass boiler
Hot Water Temperature	82°C - Δ 16°C (180°F - Δ 28.8°F) OAT reset	ground loop varies seasonally
Hot Water Flow	Single speed primary-only pumping, VSD	High efficiency VSD pump
COOLING PLANT		
Central Cooling Efficiency	cooling provided by in-suite AC units Cooling electric COP 2.93	water-source VRF connected to central ground loop COP 5.0 in cooling
Chilled Water Temperature		ground loop varies seasonally
Chilled Water Flow		High efficiency VSD pump
DOMESTIC HOT WATER (DHW)		
Heating Efficiency	1 natural gas DHW tank heater: 80%	Heat pump COP 3
	1	53% reduction
Avg. Load (GPM)	4.4	(ultra low-flow and misting fixtures, drain heat recovery)
Avg. Load (GPM)  ONSITE RENEWABLE ENERGY  Photovoltaic panels (available area)	4.4	

#### **Public School Archetype**

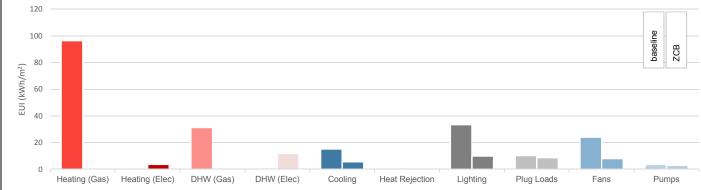
#### **Key Building Characteristics**



The school archetype represents a 73,932 ft² (6,871 m²) one-storey building. The building contains a kitchen (2.4% of total building area), cafeteria (4.6%), bathrooms (2.8%), computer room (2.4%), gym (5.2%), library (5.8%), mechanical and electrical room (3.7%), offices (6.4%), and classrooms (48%). The building has a wall-to-roof area ratio of 37%. The window-to-wall area ratio is approximately 35%. Walls are concrete mass walls.

BASELINE HVAC: 2 packaged VAV systems serve all classroom and office areas. The gym and kitchen areas each have dedicated constant volume rooftop units (RTUs). Units will include a direct expansion (DX) cooling coil and an indirect gas heating section. All perimeter areas also have hydronic baseboards connected to a two single-stage boiler plant.

ZERO CARBON DESIGN: This package involves a higher performance envelope than the baseline design, reduced internal loads and design considerations for PV (both roof-mounted and site). Mechanically, this package involves a centralized dedicated outdoor air distribution system (DOAS) with zone-level ventilation control. This package also further incorporates central exhaust heat recovery (90% effectiveness), and introduces a central ground source heat pump (GSHP) system serving in-floor radiant heating/cooling for classrooms, while incorporating water-cooled variable refrigerant flow (VRF) for heating/cooling delivery for office areas. It includes a supplementary biomass boiler to inject heat into the ground loop as required to maintain balanced operation. Lighting will incorporate directly addressable LED fixtures tied to occupancy sensors that provide advance, fine-tuned control over light levels in areas where occupant activity is occurring.



0	1									
Heating (Gas) Heating (Elec) DHW (Gas	) DHW	(Elec)	Cooling	Heat R	Rejection	Lighting	Plug Loads	Fans Pumps		
Item	m	odified N	ECB 2011	Baseline			Zero Carb	oon Design		
EXTERIOR SURFACES										
Wall Overall R-Value	Mass	Metal	Steel	Other	R <sub>net</sub>		30	(net)		
	100% 20.4	0% 20.4	0% 20.4	0% 20.4	20.4					
Roof Overall R-Value	Ir	nsulation	Entirely ab	ove Deck			40	(net)		
			31.0				40	(net)		
GLAZING										
Glazing Percent			35.0%				Same as	s Baseline		
Window U-value	Nonmetal framing, all	Metal Framing, fixed	Metal Framing, operable	Metal Framing, entrance door	U <sub>o</sub>		0.2	216		
	0% 0.39	100% 0.39	0% 0.39	0% 0.39	0.39					
Window Solar Heat Gain Coefficient			0.6				0.2	270		
SPACE CONDITIONS										
Schedules		NECB 2	2011 Sche	dule D			Same as	s Baseline		
Lighting	Classroo	m 1.24 W	/ft²; Other	: 0.88 W/ft	² (avg)	42% reduction (LED and controls)				
Equipment density	Kitchen:		oom 0.465 ft²; Other:	W/ft² 0.148 W/ft²	² (avg)	15% reduction		liances, energy saving classroon and controls)		
Infiltration	0.05	cfm/ft2 of	total wall a	and roof are	eas		75% re	eduction		

#### **Public School Archetype**

Air Handling	25 RTUs with DX cooling and gas furnace, with hydronic baseboards for perimeter heating.	Central DOAS
Principle Heating Fuel Type	Natural Gas Furnace	VRF connected to ground loop - non-classrooms Radiant in-floor heating from central GSHP - classrooms Supplemented by peaking biomass boiler
Cooling Source	Air-cooled condenser and DX Cooling	VRF connected to ground loop - non-classrooms Radiant in-floor cooling from central GSHP - classrooms
Supply Air Temperature Control	Cooling: 13°C (55°F) Heating: 33°C (92°F) Reset: 18°C at OAT 16°C; 13°C at OAT 27°C (65°F at OAT 60°F; 55°F at OAT 80°F)	DOAS: Cooling: 21°C (70°F) Heating: 24°C (75°F)  Terminal VRF units: Cooling: 13°C (55°F) Heating: 38°C (100°F)
an Power	Supply fans: Total Static (inches water gauge): 2.6 Total Efficiency: 0.4	DOAS Supply/Return fan: Total Static (inches water gauge): 3/2 Total Efficiency: 0.55/0.50  VRF Terminal Units: Design kW/cfm: 0.00078
Outside Air	Sum of Zone OA	DCV (36% reduction)
Fan Curve (VAV only)	Constant Volume	VFD on all systems
Energy Recovery	None	90% energy recovery effectivness (reverse-flow)
HVAC CONTROL	<u> </u>	, , , , , , , , , , , , , , , , , , ,
Heating and Cooling Setpoints	Heating: 22°C (72°F) Cooling: 24°C (75°F)	Heating: 22°C (72°F) Cooling: 24°C (75°F)
Economizer	Dual Enthalpy	Dual Enthalpy
HEATING PLANT		
Central Heating Efficiency	1 modulating boiler (down to 25% capacity): 83% rated efficiency	Central ground source heat pumps Heating COP: 3.2 VRF providing heating for non-classroom zones Heating COP: 5.9 Supplemented by peaking biomass boiler
Hot Water Temperature	82°C - Δ 16°C (180°F - Δ 28.8°F)	54°C - ∆ 16°C (130°F - ∆ 28.8°F) ground loop: varies
lot Water Flow	Single speed primary-only pumping	Premium variable speed pumping
COOLING PLANT		
Central Cooling Efficiency	DX COP 2.84 to 3.45	Central ground source heat pumps Cooling COP: 5.8 Water-cooled VRF connected to ground loop Cooling COP: 5.0
Chilled Water Temperature		$7^{\circ}\text{C}$ - $\Delta$ $6^{\circ}\text{C}$ (44°F - $\Delta$ 11°F) ground loop: varies
Chilled Water Flow		Premium variable speed pump
DOMESTIC HOT WATER (DHW)		
Heating Efficiency	1 natural gas DHW tank heater: 83% efficiency	Heat pump COP: 3
Avg. Load (GPM)	3.4	34% reduction (ultra low-flow fixtures)
ONSITE RENEWABLE ENERGY		
Photovoltaic panels (available area)	_	80% of roof area and a portion of site area (825 m <sup>2</sup> )

#### Low-Rise MURB Archetype

**Key Building Characteristics** 



The low-rise MURB archetype represents a 33,750 ft² (3,135 m²), 4-storey building with a wall-to-roof area ratio of 2. The window-to-wall area ratio is 20%. The exterior façade is comprised of window wall, with continuous interior insulation on the inboard side of metal spandrel panel assemblies. The zoning includes 8 apartments and 1 core zone per floor. A set of 2 elevators and 2 exit stairwells serve the building access and egress requirements.

BASELINE HVAC: The suites are served by fan coil units (FCUs) with hydronic heating coils and direct expansion (DX) cooling (through the wall). A central make-up air unit (MAU) unit provides 100% outdoor air (OA) to the core zones, and into the suites via door undercuts. The central MAU will be located on the roof and will include hydronic heating coil, DX cooling coil. Envelope losses in corridors will be handled by hydronic perimeter baseboards. Hydronic heating is connected to one single-stage boiler with a single speed pump to be fitted with a variable frequency drive (VFD). All heating terminals will use two-way valves.

ZERO CARBON DESIGN: This package involves a higher performance envelope than the baseline design, reduced internal loads and design considerations for PV (both roof-mounted and site). Mechanically, this package involves a centralized air distribution system with zone-level ventilation control, as well as incorporating variable refrigerant flow (VRF) for heating/cooling delivery. This package also further incorporates central exhaust heat recovery, and introduces a central geoexchange system. Lighting will incorporate directly addressable LED fixtures tied to occupancy sensors that provide advance, fine-tuned control over light levels in areas where occupant activity is occurring.



Wall Overall R-Value	Heating (Gas) Heating (Elec) DHW (G
Wall Overall R-Value	Item
Value   Valu	EXTERIOR SURFACES
Insulation Entirely above Deck   31.0   40 (net)	Wall Overall R-Value
Same as Baseline   Same as Bas	
Same as Baseline   Same as Bas	Roof Overall R-Value
Color   Colo	OLATINO.
Window U-value    Window U-value	
0%         100%         0%         0%           0.39         0.39         0.39         0.39	Glazing Percent
0.39 0.39 0.39 0.39	Window U-value
Window Solar Heat Gain Coefficient 0.6 0.270	
	Window Solar Heat Gain Coefficient
SPACE CONDITIONS	SPACE CONDITIONS
Schedules NECB 2011 Schedule G Same as Baseline	Schedules
Lighting 0.495 W/ft² (avg) 40% reduction (LED & controls)	Lighting
Equipment density  0.419 W/ft² (avg)  25% reduction (EnergyStar appliances and process equipment density savings)	Equipment density
Infiltration         0.05 cfm/ft2 of total wall and roof areas         50% whole-enclosure reduction interface detailing	Infiltration

# Low-Rise MURB Archetype

LIVAC OVOTEM TVDE		
HVAC SYSTEM TYPE		
Air Handling	Central MAU serving corridors FCUs for suite space conditioning	Central DOAS
Principle Heating Fuel Type	Natural gas boiler serving hydronic coils in FCU and MAU, and baseboards (non-suite perimeter)	Electricity - water-source VRF fed by ground loop
Cooling Source	DX cooling for MAU, and DX coils in the FCUs (split condenser for each unit)	Electricity - water-source VRF fed by ground loop
Supply Air Temperature Control	MAU Cooling/Heating: 21°C/24°C (70°F/75°F) FCUs Cooling/Heating: 13°C/38°C (60°F/100°F)	Cooling: 16°C (60°F) Heating: 38°C (100°F)
Fan Power	MAU, Supply/Return: Total Static (inches water gauge): 3/1 Total Efficiency: 0.55	MAU, Supply/Return: Total Static (inches water gauge): 3/1 Total Efficiency: 0.53
	Suite unit:: 0.0003 kW/cfm	VRF terminal unit: 0.000193 kW/cfm
Outside Air	OA supply through corridor pressurization 0.5 ventilation effectiveness	Direct-ducted OA supply 1.0 ventilation effectivenss
Fan Curve	MAU constant volume FCU two-speed	VFD for DOAS w/ fans/ductwork oversized by 30%
Energy Recovery	None	75% energy recovery effectiveness
HVAC CONTROL		
Heating and Cooling Setpoints	Heating: 22°C (72°F) Cooling: 24°C (75°F)	Heating: 22°C (72°F) Cooling: 24°C (75°F)
Economizer	Dual Temperature	Dual Enthalpy
HEATING PLANT		
Central Heating Efficiency	2 modulating boilers (down to 25% capacity): 83% rated efficiency	Water-cooled VRF connected to ground loop COP 5.9 in heating
Hot Water Temperature	82°C - Δ 16°C (180°F - Δ 28.8°F)	ground loop varies seasonally
Hot Water Flow	Single speed primary-only pumping. Pump motor to be fitted with VFD, all heating terminals will use two-way valves	High efficiency VSD pump
COOLING PLANT		
Central Cooling Efficiency	cooling provided by in-suite AC units Cooling electric COP 2.93	Water-cooled VRF connected to ground loop COP 5.0 in cooling
Chilled Water Temperature		ground loop varies seasonally
Chilled Water Flow		High efficiency VSD pump
Cooling Tower		not installed
DOMESTIC HOT WATER (DHW)		
Heating Efficiency	1 natural gas DHW tank heater: 80%	Heat pump COP 3
Avg. Load (GPM)	1.75	50% reduction (ultra low-flow and misting fixtures, drain heat recovery)
		3
ONSITE RENEWABLE ENERGY Photovoltaic panels (available area)		

#### Warehouse Archetype

#### **Key Building Characteristics**

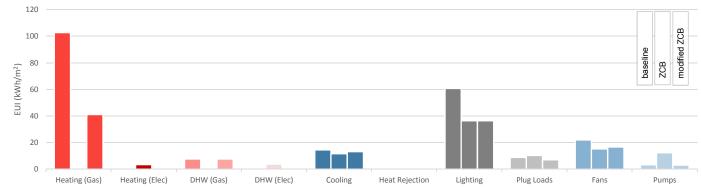


The warehouse archetype represents a 49,500 ft² (4,600 m²) one-storey building. The building contains an office area that is 5% of the total area of the building. The building has a wall-to-roof area ratio of 0.5. The window-to-wall area ratio is less than 1%. Skylights are installed in the warehouse areas, with total coverage of 68 m2. Walls are 50% concrete mass and 50% insulated metal panel.

BASELINE HVAC: The HVAC system includes 5 rooftop units (RTUs) equipped with air-side economizers, hydronic heating and direct expansion (DX) cooling. Two natural gas boilers provide heating. DX cooling in RTUs will provide cooling to the warehouse and office areas, with supplemental heating provided by baseboards (office areas) and unit heaters (warehouse areas).

ZERO CARBON DESIGN: This package involves a higher performance envelope than the baseline design, reduced internal loads and design considerations for PV (both roof-mounted and site). Mechanically, this package involves the use of a dedicated outdoor air system (DOAS) with displacement ventilation (DV) and includes in-floor radiant heating/cooling for the warehouses and variable refrigerant flow (VRF) for the office area. This package also further incorporates central exhaust heat recovery (90% efficiency), over-sized fans, and introduces a central ground source heat pump (GSHP) system (supplemented by a biomass boiler). Lighting will incorporate directly addressable LED fixtures tied to occupancy sensors that provide advanced, fine-tuned control over light levels in areas where occupant activity is occurring.

MODIFIED ZERO CARBON DESIGN: Equivalent to above, except GSHP has been removed, and the DOAS serves the RTUs directly (instead of zonal DV), which provide heating using indirect fire burners and cooling using DX coils. Supplemental heating is provided by hydronic baseboards and unit heaters. Windows are also reset to baseline performance. The size of the PV array has been increased to offset the carbon impact.



Heating (Gas) Heating (Elec) DHV	W (Gas) DH	N (Elec)	Cooling	Heat F	Rejection	Lighting	Plug Loads	Fans	Pumps
Item		modified N	NECB 2011	Baseline			Zero Carl	oon Design	
EXTERIOR SURFACES									
Wall Overall R-Value	Mass	Metal	Steel	Other	R <sub>net</sub>	30 (net)			
	50% 20.4		0% 20.4	0% 20.4	20.4				
Roof Overall R-Value		Insulation	Entirely ab 31.0	ove Deck		40 (net)			
GLAZING									
Glazing Percent			1.0%				equivalent	to baseline	
Window U-value	Nonmetal framing, all	Metal Framing, fixed	Metal Framing, operable	Metal Framing, entrance door	O°	0.216 [modified: equivalent to baseline]			
	0%		0% 0.39	0% 0.39	0.39				
Window Solar Heat Gain Coefficient	indow Solar Heat Gain Coefficient 0.6					0.	600		
SPACE CONDITIONS									
Schedules		NECB 2011 Schedule A			equivalent to baseline		·		
Lighting	Bulk:0.5	Bulk:0.59 W/ft² Fine:0.95 W/ft² Office:1.11 W/ft²			5	3% reduction (LE	D and zonal cont	rol)	
Equipment density	Bulk	Bulk & Fine: 0.093 W/ft² Office:0.697 W/ft²				22% re	eduction		
Infiltration	0.0	5 cfm/ft2 of	total wall a	and roof are	eas	50% re	duction (prefab pa	nel and interface	detailing)

#### Warehouse Archetype

HVAC SYSTEM TYPE		
Air Handling	5 RTUs with unit heaters, hydronic baseboards for	Central DOAS
	office perimeter heating	[modified: DOAS serving 5 RTUs]
Principle Heating Fuel Type	Natural gas furnace	Electricity - GSHP [modified: equivalent to baseline]
Cooling Source	Air-cooled condenser and DX Cooling	Water-cooled VRF connected to geo-exchange [modified: equivalent to baseline]
Supply Air Temperature Control	Cooling: 13°C (55°F) Heating: 43°C (109.8°F)	Cooling: 16°C (60°F) Heating: 32°C (90°F) [modified: equivalent to baseline]
Fan Power	Supply fan: Total Static (inches water gauge): 2.6 Total Efficiency: 0.4	Supply/Return: Total Static (inches water gauge): 3/1 Total Efficiency: 0.5 Packaged Unit: 0.000193 kW/cfm
Outside Air	Sum of Zone OA	demand control (DCV)
Fan Curve (VAV only)	Constant Volume	VSD on all systems
Energy Recovery	None	90% energy recovery effectiveness
HVAC CONTROL		9, ,
Heating and Cooling Setpoints	Heating: 22°C (72°F) Cooling: 24°C (75°F)	Heating: 22°C (72°F) Cooling: 24°C (75°F)
Economizer	Dual temperature	Dual enthalpy
HEATING PLANT		
Central Heating Efficiency	2 modulating boilers (down to 25% capacity): 83% rated efficiency	Central ground source heat pumps Heating COP: 3.2 water-source VRF for office areas [modified: equivalent to baseline]
Hot Water Temperature	82°C - Δ 16°C (180°F - Δ 28.8°F)	54°C - $\Delta$ 17°C (130°F - $\Delta$ 30°F) [modified: equivalent to baseline]
Hot Water Flow	Single speed primary-only pumping	variable speed pumping
COOLING PLANT		
Central Cooling Efficiency	Air-cooled condenser: COP 3.45	Central ground source heat pumps Cooling COP: 5.8 water-source VRF for office areas [modified: equivalent to baseline]
Chilled Water Temperature		7°C - Δ 6°C (46°F - Δ 10°F) [modified: n/a]
Chilled Water Flow		variable speed pumping
DOMESTIC HOT WATER (DHW)		1 1 1 0
Heating Efficiency	1 natural gas DHW tank heater: 80%	Heat pump COP 3 [modified: equivalent to baseline]
Avg. Load (GPM)	0.35	25.5% reduction (ultra low-flow fixtures)
ONSITE RENEWABLE ENERGY		
Photovoltaic panels (available area)	-	50% of roof area and a portion of site area (552 m <sup>2</sup> )

#### **Big Box Retail Archetype**

#### **Key Building Characteristics**

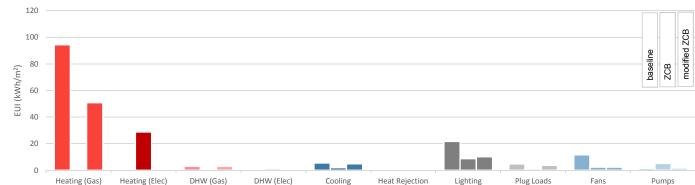


The retail archetype represents a 24,689 ft² (2,294 m²) one-storey building. The building contains a back storage space that is 17% of the total area of the building. The building has a wall-to-roof area ratio of 0.5. The window-to-wall area ratio is approximately 7.2%. Skylights are installed in the core retail areas, with total coverage of 24 m². Walls are 50% concrete mass and 50% insulated metal panel.

BASELINE HVAC: The retail and storage areas are served by packaged constant volume rooftop units (RTUs) with indirect gas-fired heating and a direct expansion (DX) cooling section, along with and hydronic radiant panels for perimeter heating, connected to a central, single-stage boilder. Cooling is provide to the retail spaces and storage area by DX cooling in RTUs and the make-up air unit (MAU).

ZERO CARBON DESIGN: This package involves a higher performance envelope than the baseline design, reduced internal loads and design considerations for PV (both roof-mounted and site). Vestibule zones are added for all storage bay entries, including high-speed roll-up doors with exceptional air-sealing, creating a partially conditioned buffer zone where loading/unloading activities can take place. Mechanically, this package involves the use of a dedicated outdoor air system (DOAS) and includes in-floor radiant heating for all areas, along with fan-coil units for cooling. This package also further incorporates central exhaust heat recovery (75% efficiency), over-sized fans, and introduces a central ground source heat pump (GSHP) system. Lighting will incorporate directly addressable LED fixtures tied to occupancy sensors that provide advanced, fine-tuned control over light levels in areas where occupant activity is occurring.

MODIFIED ZERO CARBON DESIGN: Equivalent to above, except GSHP has been removed, and the DOAS serves the RTUs directly (instead of zonal DV), which provide heating using indirect fire burners and cooling using DX coils. Supplemental heating is provided by hydronic baseboards and unit heaters. Windows are also reset to baseline performance. The size of the PV array has been increased to offset the carbon impact.



Heating (Gas)	Heating (Elec)	DHW (Gas)	DHW	(Elec)	Cooling	Heat I	Rejection	Lighting	Plug Loads	Fans	Pumps
Iter	n		modified NECB 2011 Baseline				Zero Carbon Design				
EXTERIOR SURFACES											
Wall Overall R-Value			Wass 50%	Metal W05	Steel 0%	Other %	R <sub>net</sub>	30 (net)			
			20.4	20.4	20.4	20.4	20.4				
Roof Overall R-Value			- 1	Insulation	Entirely ab 31.0	ove Deck		40 (net)			
GLAZING											
Glazing Percent					7.2%				equivalen	t to baseline	
Window U-value			Nonmetal framing, all	Metal Framing, fixed	Metal Framing, operable	Metal Framing, entrance door	U <sub>o</sub>	0.216 [modified: equivalent to baseline]		e]	
			0% 0.39	100% 0.39	0% 0.39	0% 0.39	0.39				
Window Solar Heat Gain C	oefficient				0.600				0.	.600	
SPACE CONDITIONS											
Schedules	•		NECB 2011 Schedule C			equivalen	t to baseline				
Lighting			Retail: 1.68 W/ft², Storage: 0.63 W/ft²				40% reduction (	(LED and control	s)		
Equipment density			Retail: 0.232 W/ft², Storage: 0.093 W/ft²					reduction			
Infiltration			0.05	cfm/ft2 of	total wall a	and roof ar	eas	50% re	eduction (prefab pa	anel and interfac	e detailing)

#### **Big Box Retail Archetype**

HVAC SYSTEM TYPE		
Air Handling	5 RTUs with indirect gas-fired heating and a DX cooling section	Central DOAS [modified: DOAS serving 5 RTUs]
Principle Heating Fuel Type	Natural Gas Boilers serving BBs Indirect NG heating in AHUs	Electricity - GSHP serving radiant floor perimeter heating [modified: equivalent to baseline]
Cooling Source	Air-cooled condenser and DX Cooling	Electricity - Central GSHP serving fan-coils [modified: equivalent to baseline]
Supply Air Temperature Control	Cooling: 13°C (55°F) Heating (stg/retail): 43°C/18°C (110°F/65°F)	Cooling: 18°C (65°F) Heating: 29°C (85°F) [modified: equivalent to baseline]
Fan Power	Supply fans: Total Static (inches water gauge): 2.6 Total Efficiency: 0.40	Central DOAS Supply/Return Total Static (inches water gauge): 3/1 Total Efficiency: 0.5/0.5  FCUs: Total Static in WG: 2 Total Efficiency: 0.55
Outside Air	Sum of Zone OA	DCV
Fan Curve (VAV only)	Constant Volume	VSD on all systems
Energy Recovery	None	75% energy recovery effectiveness
HVAC CONTROL		10% chargy receivery emocurement
Heating and Cooling Setpoints	Heating: 22°C (72°F) Cooling: 24°C (75°F)	Heating: 22°C (72°F) Cooling: 24°C (75°F)
Economizer	OA Temp, Drybulb High Limit: 18°C (65°F)	Dual Temperature
HEATING PLANT		
Central Heating Efficiency	2 modulating boilers (down to 25% capacity): 83% rated efficiency	Central ground source heat pumps providing heating Heating COP: 3.2 [modified: equivalent to baseline]
Hot Water Temperature	82°C - Δ 17°C (180°F - Δ 30°F)	54°C - Δ 17°C (130°F - Δ 30°F) [modified: equivalent to baseline]
Hot Water Flow	High efficiency VSD pump	High efficiency VSD pump
COOLING PLANT		
Central Cooling Efficiency	DX COP 2.8	Central ground source heat pumps providing cooling Cooling COP: 5.8 [modified: equivalent to baseline]
Chilled Water Temperature		8°C - $\Delta$ 6°C (46°F - $\Delta$ 10°F) [modified: n/a]
Chilled Water Flow		High efficiency VSD pump
DOMESTIC HOT WATER (DHW)		
Heating Efficiency	1 natural gas DHW tank heater: 80%	Heat pump heater:  COP 3 [modified: equivalent to baseline]
Avg. Load (GPM)	0.5	0% reduction
ONSITE RENEWABLE ENERGY		
Photovoltaic panels (available area)	-	50% of roof area and a portion of site area (460 m²)





# **A-2** ENERGY MODELING NOTES

#### **ENERGY MODELING PROCESS**

The primary simulation platform used for this study was eQuest v3.65, with OpenStudio baseline models developed by the NRC used for validation of some archetypes.

The primary goal of the energy modeling was to generate consistent representations of the archetype buildings and implementation of the bundles of energy conservation measures. Accurate representation of local markets and construction standards was also important. Meaningful comparisons (i.e. deltas) between different archetypes and locations relied on this consistency, which minimizes the impact of other confounding variables.

The sub-sets of energy conservation measures included in this study were selected and applied to the models based on experience drawn from work on actual building projects, targeting the most effective means of achieving significant carbon reductions. These measures were packaged together in "bundles" representing key strategies that apply across building types.

Therefore, for the purposes of this national study, overarching design approaches were fixed across all locations, while specific implementation, operational assumptions, and costs were modified to suit typical construction as closely as reasonable. In real world application, some measures may not be optimal for all locations or archetypes. Case-by-case design optimization was considered beyond the scope of this study and would have made the comparative analysis of bundles impossible.

#### **CASCADING BUNDLES**

The individual bundle modeling process was straight-forward: the appropriate modeling changes for each individual bundle were applied to the baseline models, respecting the fact that equipment sizes may need to be larger than when included in the combined package.

The cascading bundle process was somewhat more complex. During the process of modeling the cascading bundles of improvements, independent bundles sometimes required HVAC system changes for the interim (i.e. partial) model to function properly, resulting in intermediate configurations not carried through to the final package. For example, where heating/cooling delivery involved VRF or heat pump terminals, but no GSHP was included, either air-source VRF systems or a conventional water loop heat pump was assumed. Other, less minor, but similar variations were included for other bundles.

#### MEASURES CONSIDERED. BUT NOT MODELED

A variety of other energy conservation and carbon reduction measures were considered but not included in the scope of this study.

- Thermochromic or electrochromic glass: impact on peak demand, where it might demonstrate greatest benefit, was not a focus of the study.
- · Phase change enclosure materials/layers: similar impact/benefit as controlled glazings (shifts/smooths peak demand).
- · Variations in the window-to-wall ratio: NECB baseline designs were considered to already have reasonable WWR.
- · Alternative sources for thermal energy for heat pumps (air, sewage, industrial processes, etc.).





- Alternative renewable energy technologies such as small-scale wind or hydro electric: these are considered very site-specific and not appropriate for broad, national conclusions.
- Battery (or other) storage of electricity to smooth out demand, though this technology is considered important to the future of low-carbon and dynamic grids.

#### **PV ANALYSIS**

For the ZCB designs, the target for installed capacity of onsite PV generation was set based on the installed capacity that would be required to offset remaining GHG emissions, after all other energy conservation bundles were applied. The actual installed PV capacity was constrained by available space.

Total available space for PV installation was assumed to be 50-80% of roof area (with the variation due to the presence of skylights or other major obstructions), and 12-20% of adjacent site area (over parking, not applicable for the mid-rise archetypes).

Average performance from three best-in-class fixed Mono-Si solar panels and inverters were assumed (readily available on the market), with a racking system grid that is consistent with the grid-pattern of the roof. Additional rack-mounted PV was included over exposed portions of site area adjacent to building. Specific performance specs for the PV arrays are as follows:

- 6" mono-crystalline solar cells
- 1.62 m² panel area
- 162 W/m² nominal capacity (15-19% efficiency)
- 96% inverter efficiency at a DC to AC size ratio of 1.2
- Overall system losses of 14%

Hourly solar radiation for each location was based on TMY data for each location, with panels positioned facing due South (azimuth 180°):

#### **Solar PV Location Information**

City	Weather Station	Latitude : Longitude	Tilt (degrees)	Solar Radiation (kWh/m²/day)
Toronto	Toronto Pearson Intl AP	43.677 ; -79.631	35	4.60
Ottawa	Macdonald-Cartier Intl AP	45.317 ; -75.667	40	4.57
Calgary	Calgary Intl AP	51.114 ; -114.020	45	4.55
Halifax	Halifax Stanfield Intl AP	44.881; -63.509	40	4.36
Vancouver	Vancouver Intl AP	49.195 ; -123.184	40	3.95
Montreal	Montreal-Trudeau Intl AP	45.471 ; -73.741	40	4.56

The contribution towards GHG emissions reduction by PV is calculated based on the Zero Carbon Buildings guidelines, which credits hourly PV generation based on either the local average grid emissions factor (where offsetting onsite electricity demand) or the marginal emissions factor (where generation surpasses onsite electricity requirements).

Hourly PV generation potential was determined using the PVWatts application for each location. This data was compared against the hourly building electricity demand for each archetype and location, under two scenarios: targeting onsite net zero GHG emissions for the full ZCB design package (if possible) and installation of a PV array covering all available area. The latter was used for assessing the life-cycle cost benefit of PV as an independent measure.

The ratio of electricity used onsite versus the portion exported over the course of a year, together with the grid emissions factors, determined how effective PV generation was for offsetting building GHG emissions. The effectiveness was further constrained by available area, with buildings having smaller roof area relative to floor area (e.g. the mid-rise archetypes) being less capable of achieving ZCB onsite (i.e. without RECs).

The range in contribution is highlighted in the summary of selected hourly results for different locations and archetypes included in Appendix B-5. Results are provided for Toronto, Calgary and Montreal for all archetypes to summarize the full range of variation.

# **A-3** CARBON ACCOUNTING

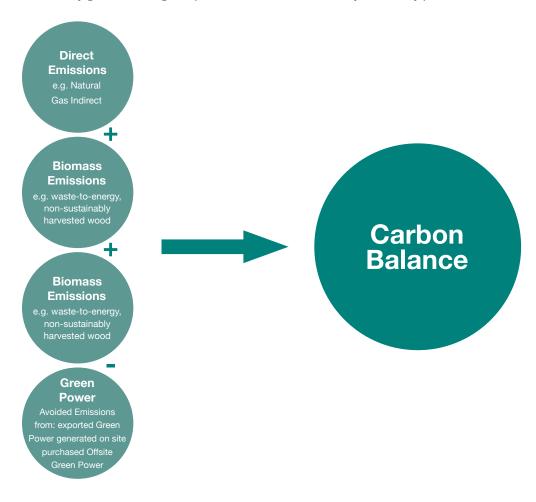
#### ZERO CARBON DEFINITION

This report applies the definition of "zero carbon balance" as outlined in the Canadian Green Building Council's (CaGBC's) Zero Carbon Buildings Standard (May 2017)<sup>1</sup>:

Projects must annually generate or procure enough zero-emissions, renewable energy to offset 100% of the GHG emissions associated with the building's total annual site energy consumption.

While the general approach in the study is to reduce carbon emissions at the site as much as possible, procurement of offsite green power (in the form of RECs) is assumed to be necessary for two reasons. First, tall buildings are unlikely to achieve a zero carbon balance onsite with current technologies. Second, market rate development is capital-cost focused. Even if a Zero Carbon bundle of onsite measures yields a small life-cycle cost premium, procurement provides a more straight-forward way to amortize costs in a capital-constrained industry.

The approach taken in the study is therefore to target a zero carbon balance onsite; first through conservation, then fuel switching followed by generation of green power within the site boundary, and finally procurement.



https://www.cagbc.org/cagbcdocs/zerocarbon/CaGBC Zero Carbon Building Standard EN.pdf





#### **PRIMARY FUEL**

Natural gas was used as the primary fuel for the baseline buildings and for the ZCB big box retail and warehouse buildings. The emission factor for natural gas varies slightly across the country, but is typically around 180 gCO<sub>2</sub>e/kWh.

Wood pellets were used as the peaking/top-up fuel for the mid-rise office and mid-rise MURB ZCBs. Pricing for pellets was confirmed by pellet manufacturers to account for sourcing from sustainability managed forests and for low or zero-carbon emission during the manufacturing, so the assumption is that emissions are 0 gCO2e/kWh per the allowance within the ZCB standard.

#### **GHG EMISSION FACTORS**

Emissions factors are used to quantify the greenhouse gas emissions produced by an activity, such as the consumption of energy for electricity generation or for the fueling of vehicles. Consumption data is multiplied by an emissions factor to quantify the associated emissions.

To enable comparisons between emissions of carbon dioxide, methane, nitrous oxide, and other greenhouse gases, a global warming potential (GWP) value is used to convert the emissions associated with each greenhouse gas into a carbon dioxide equivalent (CO<sub>2</sub>e). GWP is an indicator of the amount of radiative forcing, the difference between insolation (sunlight) absorbed by the earth and energy radiated back to space, caused by a given greenhouse gas over a specified period. Environment and Climate Change Canada's National Inventory Report (2018) uses the one-hundred-year GWP values from the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report.

An updated version of the IPCC Guidelines for National Greenhouse Gas Inventories will be released in May 2019. The update will incorporate updated scientific research associated with methane emissions related to the extraction and processing of fossil fuels including natural gas.

With a lifetime of only 12 years in the atmosphere, methane is considered a near term climate forcer (see table of Global Warming Potentials below). Most methane emissions occur during the production of natural gas, light/medium oil, and conventional heavy oil and not at the point of consumption as it relates to the heating, cooling or powering of buildings. A variety of regulatory and carbon pollution pricing mechanisms are now in use to reduce methane, especially from direct venting. Ensuring that an incremental price on carbon pollution is applied across all production and consumption processes, and takes methane emissions into account, will support the IPCC recommended target of carbon neutrality by 2050 while also enhancing the cost-effectiveness of ZCBs.

#### **Global Warming Potentials**

	20-Year GWP	100-Year GWP	500-Year GWP
Carbon Dioxide	1	1	1
Methane	72	25	7.6
Nitrous Oxide	289	298	153

Source: IPCC's Fourth Assessment Report (IPCC 2012).

CaGBC | Making the Case for Building to Zero Carbon | Appendix



#### **GRID ELECTRICITY**

For the study, the average and marginal emissions factors used are taken from the requirements of the ZCB Standard, which uses the current ENERGY STAR factors<sup>2</sup>. For easy reference, the factors used are included in the table below.

#### **GHG Emissions Factors by Province**

Province/Territory	Natural Gas Emissions (gCO <sub>2</sub> e/kWh)	Average Electricity Emissions (gCO <sub>2</sub> e/kWh)	Marginal Electricity Emissions (gCO₂e/kWh)
Saskatchewan	172	900	521
Alberta	182	880	469
Nunavut	232	750	881
Nova Scotia	179	730	711
NW Territories	232	300	881
PEI	179	287	781
New Brunswick	179	287	632
Yukon	179	41	881
Ontario	178	40	394
Newfoundland and Labrador	179	31	373
British Columbia	181	17	517
Quebec	178	2	331
Manitoba	178	4	1247

These regions can be approximately grouped into three categories:

- 1. High-carbon intensity grids (AB, NU, SK, NS/PEI, NT, NB)
- 2. Medium-carbon intensity grids (YT, ON, NL, PE)
- 3. Low-carbon intensity grids (BC, MB, QC)

As discussed below in the National Statistics section (A-5), these groupings were used to relate the studied locations to the entire building stock.

<sup>&</sup>lt;sup>2</sup> ENERGY STAR Portfolio Manager Technical Reference (August 2017). Converted from KG/Mbtu to g/kWh. <a href="https://portfoliomanager.energystar.gov/pdf/reference/">https://portfoliomanager.energystar.gov/pdf/reference/</a>





# **A-4** FINANCIAL ANALYSIS

#### **FINANCIAL METRICS**

The primary financial metrics used to analyze the cost-benefit of different overall packages and individual measures include:

- 1. Incremental Capital Cost (ICC)
- 2. Incremental Life-Cycle Cost (ILCC)

Both metrics were analyzed on a per m<sup>2</sup> and per tonne CO2-equivalent saved (\$/m<sup>2</sup> and \$/tCO<sub>2</sub>e).

These two metrics are often best used in conjunction and with a summary of total GHG reductions to better understand the combined cost-benefit of any given measure.

Incremental life-cycle cost (ILCC) is emphasized as the most important financial metric in this analysis because it captures the full financial picture, reflecting both initial investment and ongoing costs.

### **ILCC PARAMETERS**

Study length. A 25-year period is used.

Construction is assumed to begin in 2019, with capital expense spread evenly across a 3-year construction period. Buildings are assumed to be operating by 2022, at which point the 25-year life-cycle analysis period begins, with all operating costs escalated accordingly.

**Capital cost.** First/capital costs of packages were prepared based on:

- Detailed Class D estimates from A.W. Hooker & Associates for Toronto
- · City variation factors for Vancouver, Calgary, Ottawa, Montreal and Halifax
- · Additional estimates and factors of safety applied by WSP based on previous project experience

In general, contingency for design and construction was kept constant across all packages (i.e. the contingency amount carried was the same, not the contingency factor) since the technologies recommended in the ZCB scenarios were not riskier to construct than the baseline technologies. Sensitivity analysis was done, however, to show the impact of variation in energy and capital cost on the robustness of the package performance, as discussed below.

Utility costs. Costs relevant to each studied city are provided below. Annual escalation was 2%.

Costs for biomass were kept the same in each market at ~\$0.09/kWh, despite the expectation that pricing will vary significantly, especially as the sustainably-harvested wood biomass market begins to grow in Canada, affecting a currently export-dominated market.





City	Provinces	Ele	ectricity Cost (\$/kV	Natural Gas (\$/kWh)	Elec/Gas	
City	FIOVILICES	Warehouse, LR MURB, Retail	School, LR Office, MR MRB	MR Office	All buildings	Elec/Gas
Toronto	ON	0.155	0.141	0.146	0.034	4.3
Calgary	AB	0.074	0.065	0.061	0.017	3.9
Vancouver	ВС	0.087	0.081	0.075	0.033	2.5
Montreal	QC	0.080	0.068	0.052	0.039	1.7
Winnipeg	MB	0.066	0.056	0.050	0.027	2.1
Moncton	NB	0.0119	0.115	0.079	0.056	1.9
St. John's	NL	0.079	0.074	0.070	0.056	1.3
Ottawa	ON	0.131	0.129	0.125	0.034	3.7
Halifax	NS	0.128	0.117	0.101	0.056	2.1
Regina	SK	0.116	0.097	0.087	0.028	3.6

Utility rate projections are outside the scope of this study; therefore, virtual rates for "typical" building demand profiles were used to maintain consistency in long-term comparisons across locations.

Demand charges may have a significant impact on financial viability for certain technologies in some locations, and sensitivity to this variable has not been accounted for. This is a subject of potential further work, particularly to expand on the benefit of demand reduction technologies to lowering GHGs and energy costs.

**Operations & maintenance.** General operations and maintenance costs were assumed to be equal in the baselines and ZCBs, calculated as approximately 1.5% of total baseline capital cost (escalated at inflation).

Savings associated with O&M for some energy conservation measures may be significant; however, the factors that influence O&M are complex, and beyond the scope of this study. It has generally been WSP's experience that O&M costs are slightly lower for ZCB designs consistent with the assumptions in this study; however, we have ignored this difference to simplify comparison in this study.

Hydro Quebec North American Utility Rate Study. 2017 data used for study, since 2018 report was not yet complete when study began. <a href="http://www.hydroquebec.com/data/documents-donnees/pdf/comparison-electricity-prices.pdf">http://www.hydroquebec.com/data/documents-donnees/pdf/comparison-electricity-prices.pdf</a>





Service life replacement and residual value. Building component service life estimates were per the table below.

Building Component	Average Service Life (years)
Windows	30
Roof	25
Other Enclosure	40
All Structure	60
Lighting, LED, typical control	20
Other Electrical	25
General HVAC Delivery	20
Ductwork & Piping	50
General HVAC Plant	25
Biomass Boilers, typical usage	30
Geoexchange system	60
PV Panels & Structure	25
PV System Inverters	10
All Other	25

Replacement and residual costs of equipment were calculated based on service life (i.e. equipment is linearly-depreciated to service life, with replacement costs accounted for, along with residual value at the end of the study period).

**Inflation and discount rate.** Standard inflation rates (1.9%) and discount rates (2.5%) were used, as per federal government guidelines for similar studies.

All life-cycle costs were calculated relative to the baseline resulting in an incremental LCC estimate for each of the ZCBs. Life-cycle costs were calculated using a standard net present value (NPV) approach to account for the time-value of money.

Note that government discount rates are used, since they reflect the cost required to use federal or provincial bonds to fund the work. This assumption allows the results to be consistent with the costs required to support incentive programs and for most government projects.

A higher discount rate may be warranted for projects that cannot access capital at a similar cost, or when comparing to other GHG reduction projects with high return.

**Escalating cost of carbon (e.g. carbon tax).** This study uses a cost of carbon of \$50/tCO<sub>2</sub>e in 2022 and escalating by \$8/year for 25 years until 2046. This results in an average cost of carbon of \$150/tonne over the project life (including year 0).



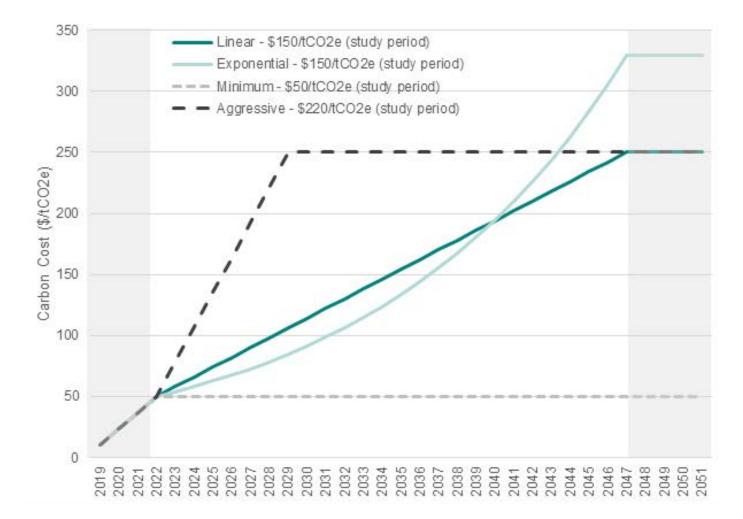


This escalation rate is derived from a combination of two sources:

- "A roadmap for rapid Decarbonization" Science May, 2017 and
- "Carbon Pricing Policy Advisory Note", National Roundtable on the Environment and the Economy, 2009

The following graphic depicts a variety of scenarios that were discussed for use in the study. In the end, the linear trend was used.

Figure 1 – Projected Cost of Carbon under different escalation scenarios







### RENEWABLE ENERGY CERTIFICATES (RECS)

Emissions reductions can also be achieved with the purchase of Renewable Energy Certificates (RECs), which are generated from offsite low-carbon electricity. In the CaGBC ZCB Standard, RECs offset onsite emissions based on the local marginal grid intensity.

This study assumes an average cost of RECs of \$25/MWh which reflects the average price for EcoLogo-certified RECs across the country (the ZCB standard requires that RECs be EcoLogo-certified).

The table below summarizes the cost of RECs per tonne of CO<sub>2</sub>e based on the local marginal grid intensity.

#### Renewable Energy Certificate (REC) Average Cost

City	REC Cost(\$/tCO <sub>2</sub> e)
Calgary	\$53
Halifax	\$35
Montreal	\$76
Ottawa	\$63
Toronto	\$63
Vancouver	\$48

These values can be used as an estimate to compare to the ILCC/ tCO<sub>2</sub>e of the packages and measures used in this study, to help gauge their cost-effectiveness.

Where RECs were needed in the study, costs were escalated at the same rate as energy prices.

#### SENSITIVITY ANALYSIS

Sensitivity analysis was completed on two archetypes (mid-rise office and low-rise MURB) for all study locations using RETScreen Expert. These analyses are meant to provide insight into the robustness of the life-cycle cost performance of the ZCB options and to show the relative impact of different components of the life-cycle on the overall results.

Sensitivity results are included in Appendix B-3 as raw outputs from RETScreen. Note that the results for life-cycle cost in RETScreen show negative as a life-cycle cost increase (i.e. negative is bad, positive is good). This interpretation is opposite to the way it is discussed in the report.





# **A-5** NATIONAL STATISTICS

#### NATIONAL BUILDING STOCK

Natural Resources Canada has summarized the available data from a variety of studies into a useful on-line resource called the Comprehensive Energy Use Database (CEUD)<sup>1</sup>: Data up to 2015 from this database were used to establish a frame of reference for the building area, energy and GHG data developed in the study, and to extrapolate to a national context

The precedent residential and commercial energy use surveys used in this study are:

- Natural Resources Canada, 2011 Survey of Household Energy Use Detailed Statistical Report, Ottawa, 2013
- Natural Resources Canada, 2014 Survey of Commercial and Institutional Buildings, Ottawa, 2016

Statistics Canada's on-line future population estimation database was also used<sup>2</sup>, officially cited as:

Statistics Canada. Table 17-10-0057-01 Projected population, by projection scenario, age and sex, as of December, 2018.

Based on the CEUD and the sources above, the table below was developed, which provides an estimated breakdown of the existing non-industrial buildings.

http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/menus/trends/comprehensive\_tables/list.cfm

https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1710005701



Category	Occupancy Type	1,000,000 m <sup>2</sup> (2018 est.)	%-category	%-total	Study Facility Mapping	Studied Area 1,000,000 m <sup>2</sup>
	Single Detached	1351	65%	46.3%	N/A	0
	Single Attached	238	11%	8.2%	N/A	0
Residential	Mobile Home	28	1%	0.9%	N/A	0
	Low-rise Apartment	305	15%	10.5%	Low-rise MURB	305
	High-rise Apartment	164	8%	5.6%	Mid-rise MURB	164
Res Total		2087				469
	Assisted daily/ residential care facilities	21	2%	0.7%	Low-rise MURB	21
	Hotels, motels or lodges	19	2%	0.7%	Low-rise MURB	19
	Office buildings (non-medical)	292	35%	10%	50%/50% - Low/Mid Office	292
	Medical office buildings	16	2%	0.6%	Low-rise Office	16
	Elementary and/or secondary schools	74	9%	2.5%	Primary School	74
Commercial	Warehouses	97	12%	3.3%	Warehouse	97
	Non-food retail stores	89	11%	3.1%	Big Box Retail	89
	Other activity or function	188	22%	6.4%	80% are Average of All Non-MURB  (20% high- intensity)	150
	Hospitals	16	2%	0.5%	N/A	0
	Food and beverage stores	23	3%	0.8%	N/A	0
Comm. Total		820				758
Grand Total (m²)		2846				1227





Assumptions were made about what fraction of each category of residential and commercial buildings could be reliably mapped to the studied archetypes (see the column labeled "Study Facility Mapping"). Only apartments were mapped to the MURB archetypes; other residential usage was excluded. For the office buildings, a split of 50/50 between low-rise and mid-rise was assumed. High-intensity institutional and commercial uses were excluded (i.e. hospitals and food/beverage stores), including 20% of the "other activity or function" category, which was assumed to be laboratory facilities and other high-intensity facilities. The remaining 80% was assigned evenly to all the non-MURB archetypes. The final floor area assigned to each archetype is summarized in the following table.

#### National Stats Table A – Archetype Breakdown of National Building Stock

Archetype	Area Assigned (1,000,000 m²)
Low-Rise MURB	345
Mid-Rise MURB	164
Mid-Rise Office	176
Low-Rise Office	193
Primary School	104
Warehouse	127
Retail	119

### **BUILDING LOCATION - POPULATION AND GRID VARIATIONS**

To accurately reflect the potential for GHG emission reductions across the country, two key parameters need to be considered: expected population growth and emissions factors from electricity generation.

The table below summarizes the expected population growth for each province, as per the Statistics Canada database referenced above, using medium growth scenario M5 (based on 2009/2010 to 2010/2011 trends). Population estimates by province are only available until 2038, so the assumption about where people will live beyond that date is based on an extrapolation of the 2038 results included below and applied to the 2049 total from the database.

Overall growth is 26% and is assumed to vary between 9% to 41% across the country.





#### **National Population Growth 2018 to 2049**

Province/Territory	Population (2018) (thousands)	Population (2038) (thousands)	Population (2049) (thousands)	Growth from 2018 (%)
Canada	36,940	43,474	46,583	26%
BC	4,830	5,734	6,144	27%
ON	14,189	16,583	17,769	25%
QC	8,494	9,582	10,268	21%
NL	534	536	575	8%
NB	768	779	834	9%
NS	954	966	1,035	8%
PE	152	177	189	25%
MB	1,345	1,704	1,826	36%
SK	1,186	1,527	1,636	38%
AB	4,362	5,723	6,132	41%

Six key locations were selected for this study: Vancouver, Calgary, Toronto, Ottawa, Montreal and Halifax. For the purposes of this study, provinces and territories without one of the representative six city were assigned a city based on similar climate and electricity grid carbon intensity. This compression of the provincial data into the seven locations is crude, but allows for a simpler estimate of total national impact without requiring study results across the country.



#### **Representative Study Locations**

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Province/Territory	Study Location
BC YT PE	Vancouver
AB SK NU	Calgary
ON	Toronto (80%) / Ottawa (20%)
NL	Ottawa
QC MB	Montreal
NB NS NTa	Halifax

One weakness of this approach is that several provinces and territories have colder climates or regions with colder climates than the locations studied. Based on previous studies, however, the financial results of energy conservation are typically much better in regions with colder climates because energy costs are typically higher due to increased demand for heating and reduced access to natural gas.

Combining the previous two tables allows for a picture of the split of national population as it would be assigned to the seven studied locations and a summary of the expected growth between 2018 and 2049. This combined result is shown in the table below.

#### National Stats Table B - Location Breakdown of Population And Growth

Location	Share of Population (2018)	Population Growth (2018 to 2049)
Vancouver	13%	27%
Calgary	15%	40%
Toronto	31%	25%
Ottawa	9%	22%
Montreal	27%	23%
Halifax	5%	9%

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#### NATIONAL RESULTS AVERAGING PROCESS

To provide a simple, but useful estimate of the impact of the studied ZCB results on the entire Canadian commercial and multi-unit residential market, Table A and Table B have been combined as follows:

For each archetype, location combination:

Assigned Area = Table A 2018 Area (Archetype) (m<sup>2</sup>) x

Table B 2018 Share (Location) (%) x

(1 + Table B 2018-2049 Growth (location) (% > 100))

This calculation provides an estimate of the total facility area for a given archetype in a given location up to 2049. The calculation assumes that the building area in 2018 was distributed according to the population in 2018 and that growth in each sector will be a function of population growth assigned to each location. This is a simplification, but it provides a useful indication of the potential of GHGs throughout the commercial and MURB sector.

To estimate the number of facilities that will be new construction (NC) by 2049 (i.e. the scope of the study) it was assumed that NC will match the average growth rate between 2018 and 2049 – approximately 26%. This factor is applied to the facility area to determine a total square footage of studied area for potential ZCBs.

NC Assigned Area = Assigned Area \* 0.26

To calculate the potential location/archetype GHG reduction, capital cost and life-cycle costs, the NC Assigned Area was multiplied by the difference in baseline and ZCB intensity (i.e. per m²) results (per Appendix B1) for each archetype/location combination.

NC Assigned GHG = NC Facility Area \* Appendix B1 GHGl for Location/Archetype

NC Assigned ICC = NC Facility Area \* Appendix B1 ICC\$/m² for Location/Archetype

NC Assigned ILCC = NC Facility Area \* Appendix B1 ILCC\$/m² for Location/Archetype

To summarize the calculation procedure, here is an example of the above calculations for Toronto, Mid-rise Office:

Assigned Area = Area(176 Mm²) \* Share(31%) \* Growth(125%) = 68.2 Mm²

NC Assigned Area = 68.2 Mm<sup>2</sup> \* 0.26 = 17.7 Mm<sup>2</sup>

NC Assigned GHG =  $17.7 \text{ Mm}^2 \cdot (15 - 0) \text{ kgCO} - 2e/m^2 = 265.5 \text{ million kgCO} - 2e \text{ saved or } 265,500 \text{ tCO} - 2e$ 

NC Assigned ICC =  $17.7 \text{ Mm}^2 * \$100 / \text{m}^2 = \$1,770,000,000 \text{ capital required}$ 

NC Assigned ILCC = 17.7 Mm<sup>2</sup> \* -\$156 / m<sup>2</sup> = \$2,761,200,000 life-cycle cost savings over 25 years.

All of the individual NC Assigned results are summed and then divided by total area to calculate weighted averages of all the important metrics (e.g. GHG reduction, ICC and ILCC) across archetypes and locations and to produce a single national average number for each key metric as summarized in the main report and in Appendix B-4.





#### **ROLL-OUT OF COSTS AND SAVINGS**

The process outlined above can be assumed to provide a reasonable estimate of the potential savings and costs for all NC buildings built between now and 2049 and to provide an indication of averages across different sectors and locations. However, providing overall benefits and averages is not the same as predicting the actual savings and costs in a changing national market, which would be useful for policy-makers to understand the costs likely to be paid by developers in order to design appropriate market incentives and other regulations.

Even if all ZCBs achieved the studied performance and had the same costs per m<sup>2</sup>, the following key factors would still need to be considered in an estimate of roll-out costs:

- 1. Disparate baseline/code conditions and relative costs and savings associated (i.e. disparity in base case)
- 2. Disparity in the market transition towards ZCBs and available incentives/disincentives that motivate action in the studied NC markets (i.e. disparity in ZCB uptake)

These factors would need to be explored in order to provide an accurate estimate of how much of the expected NC stock could be ZCB by 2050 and how much it will cost developers to implement ZCBs in their respective markets. Taking into account market specifics in each jurisdiction and estimating the actual roll-out cost as described above is a source of potential future work.

# **APPENDIX B**

**DETAILED RESULTS** 

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# **B-1** OVERALL ARCHETYPE RESULTS

In addition to the two-page summaries of TEDI, EUI, GHGI, ICC and ILCC results that follow, the following summary tables of overall financial performance have been prepared for quick reference.

ICC % increase	Mid Rise Office	Low Rise Office	Mid Rise MURB	Primary School	Low Rise MURB	Warehouse	Retail Stand Alone
Halifax	4.0%	6.4%	6.7%	15.5%	11.8%	9.1%	15.2%
Calgary	3.9%	6.3%	6.5%	16.3%	11.6%	9.4%	16.4%
Ottawa	4.0%	3.8%	6.6%	12.8%	9.8%	10.9%	14.9%
Toronto	3.9%	3.6%	6.6%	12.7%	9.7%	9.8%	12.8%
Montreal	3.5%	2.7%	6.2%	11.7%	9.1%	11.4%	14.9%
Vancouver	4.1%	3.2%	6.4%	12.0%	9.2%	9.9%	14.9%

ILCC % increase	Mid Rise Office	Low Rise Office	Mid Rise MURB	Primary School	Low Rise MURB	Warehouse	Retail Stand Alone
Halifax	-5.2%	-7.3%	-2.3%	-4.4%	-2.7%	-5.7%	-6.4%
Calgary	-3.2%	-3.7%	0.2%	0.9%	1.6%	-2.5%	-1.2%
Ottawa	-3.4%	-3.2%	-0.9%	0.1%	0.7%	-1.7%	-1.9%
Toronto	-3.9%	-3.1%	-0.9%	0.9%	1.0%	-3.0%	-3.7%
Montreal	-1.5%	-1.3%	-0.4%	1.4%	0.9%	0.4%	1.6%
Vancouver	-0.8%	-0.7%	1.0%	2.9%	2.8%	0.7%	3.3%

(negative values indicate net cost savings over 25-years)

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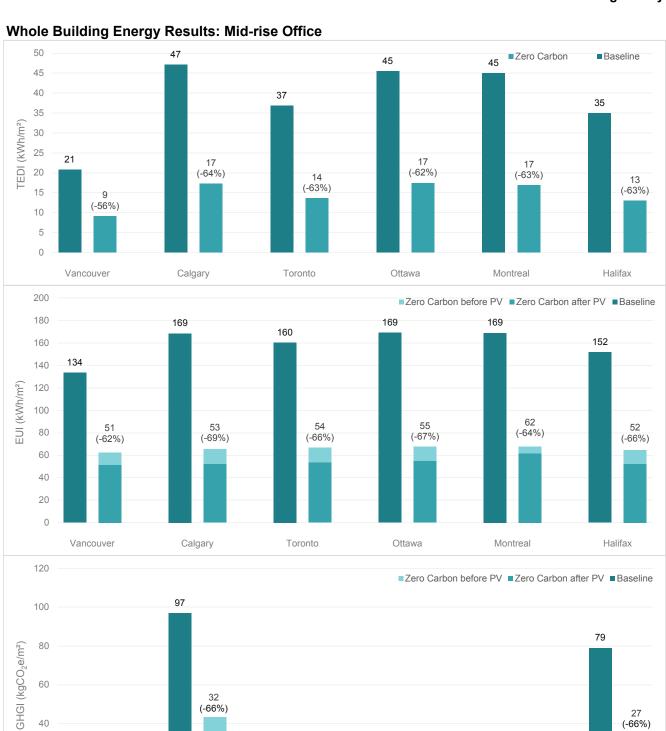


ICC/GHG- saved (\$/tCO2e)	Mid Rise Office	Low Rise Office	Mid Rise MURB	Primary School	Low Rise MURB	Warehouse	Retail Stand Alone
Halifax	97	106	240	236	256	147	151
Calgary	82	99	207	222	257	137	145
Ottawa	295	289	367	509	435	362	441
Toronto	329	321	439	655	520	418	544
Montreal	298	264	375	514	439	405	507
Vancouver	504	396	529	696	633	476	680

% of EUI before PV matched by PV generation*	Mid Rise Office	Low Rise Office	Mid Rise MURB	Primary School	Low Rise MURB	Warehouse	Retail Stand Alone
Halifax	19%	101%	25%	101%	102%	43%	61%
Calgary	20%	111%	26%	142%	113%	48%	75%
Ottawa	19%	34%	25%	32%	33%	62%	57%
Toronto	20%	34%	26%	31%	33%	64%	57%
Montreal	9%	9%	16%	6%	16%	69%	60%
Vancouver	18%	19%	20%	15%	22%	57%	50%

<sup>\*</sup> This metric shows the percent of total energy consumption met by onsite generation of electricity over the course of a year. That generation is then used to reduce the "after PV" EUIs in the tables below.

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16

0 (-100%)

Ottawa

0 (-100%)

Toronto

0 (-100%)

Halifax

Montreal

Note: All Zero Carbon labels are after accounting for PV reductions

Calgary

20

(-100%)

Vancouver

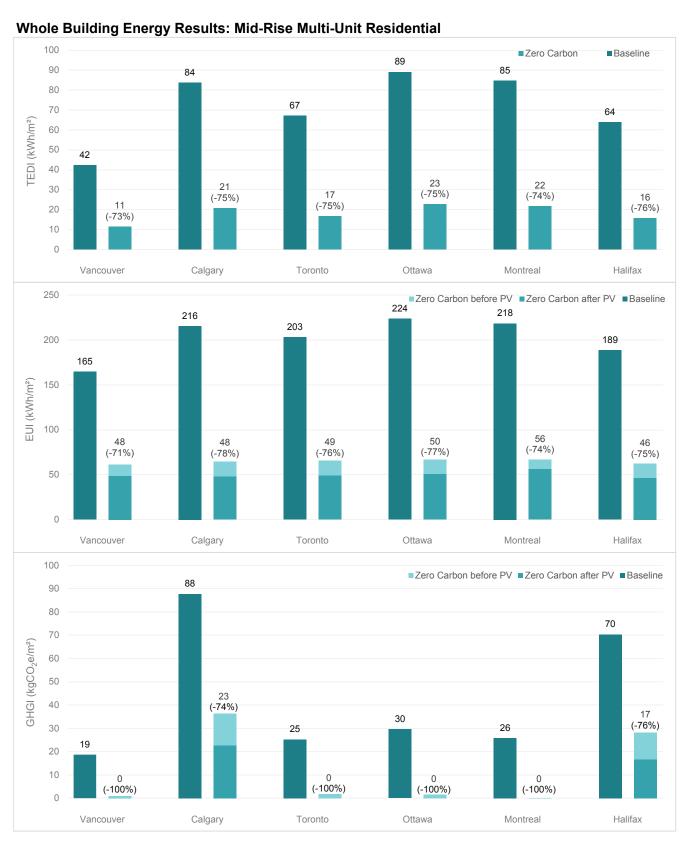


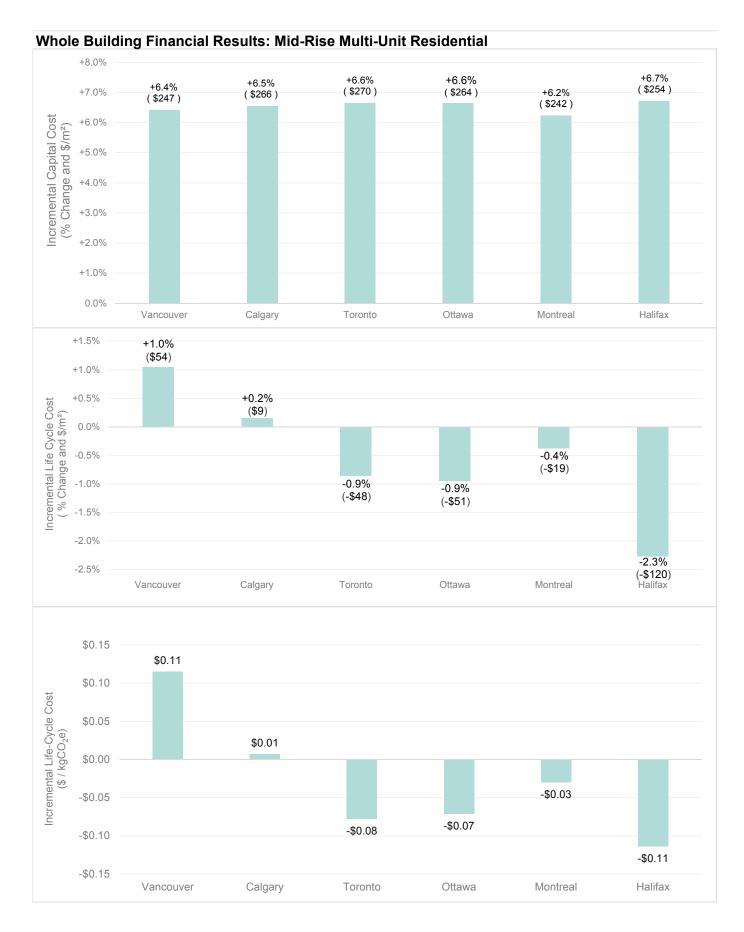
### CaGBC - Zero Carbon Buildings Study



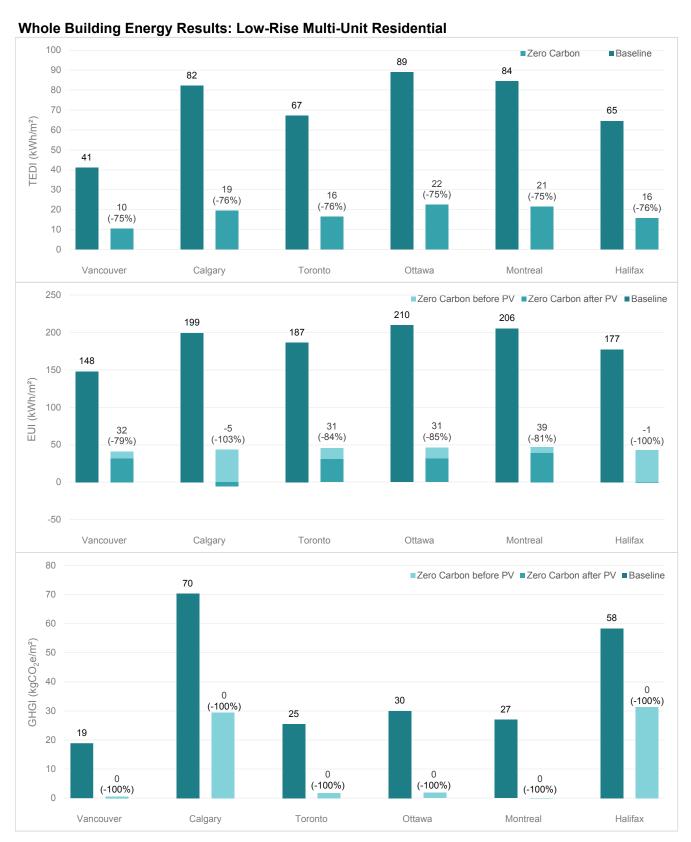


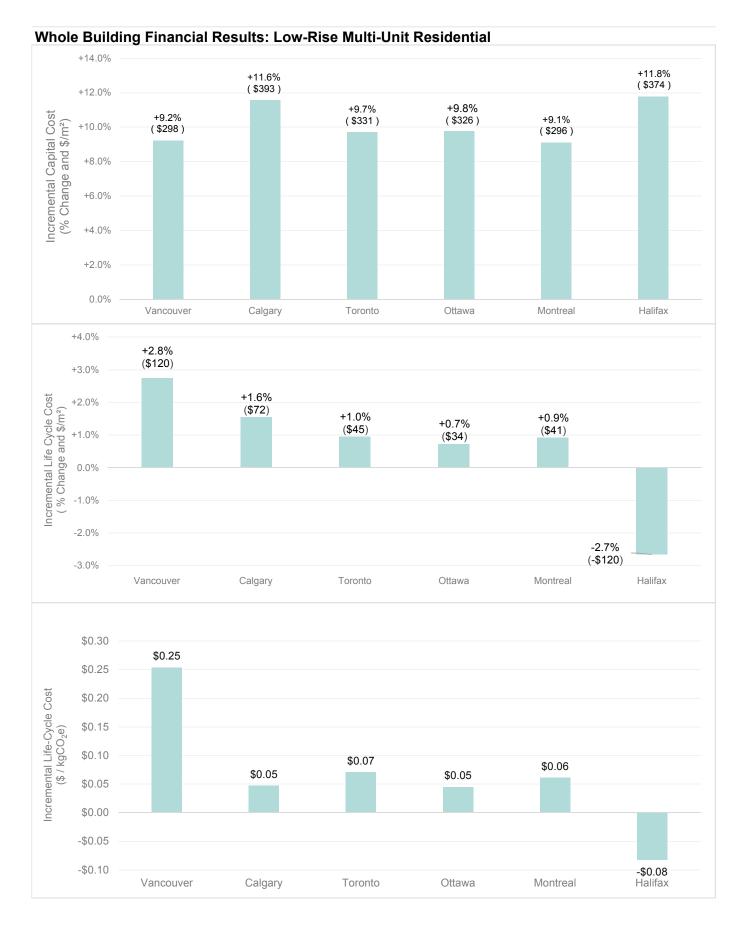
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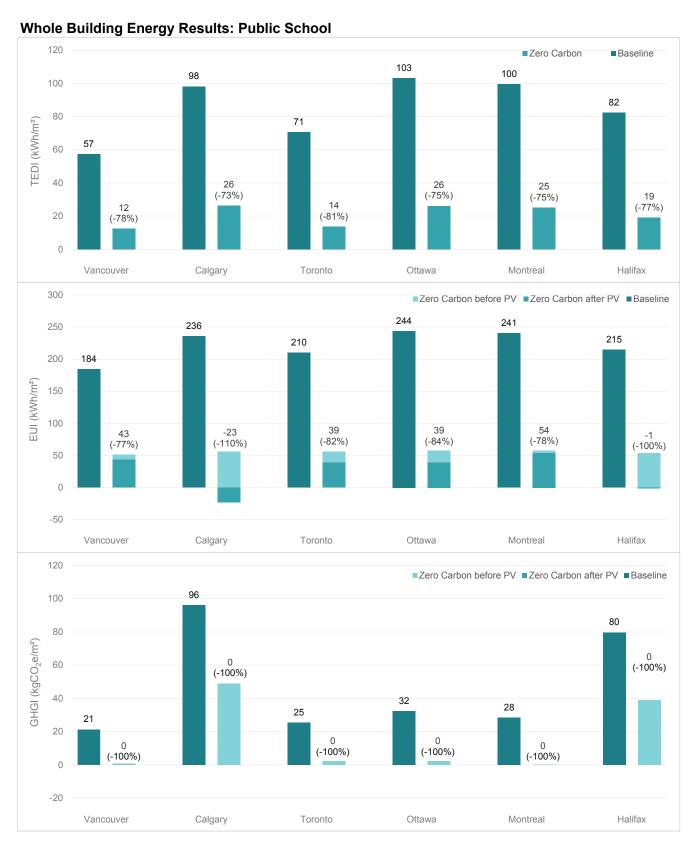


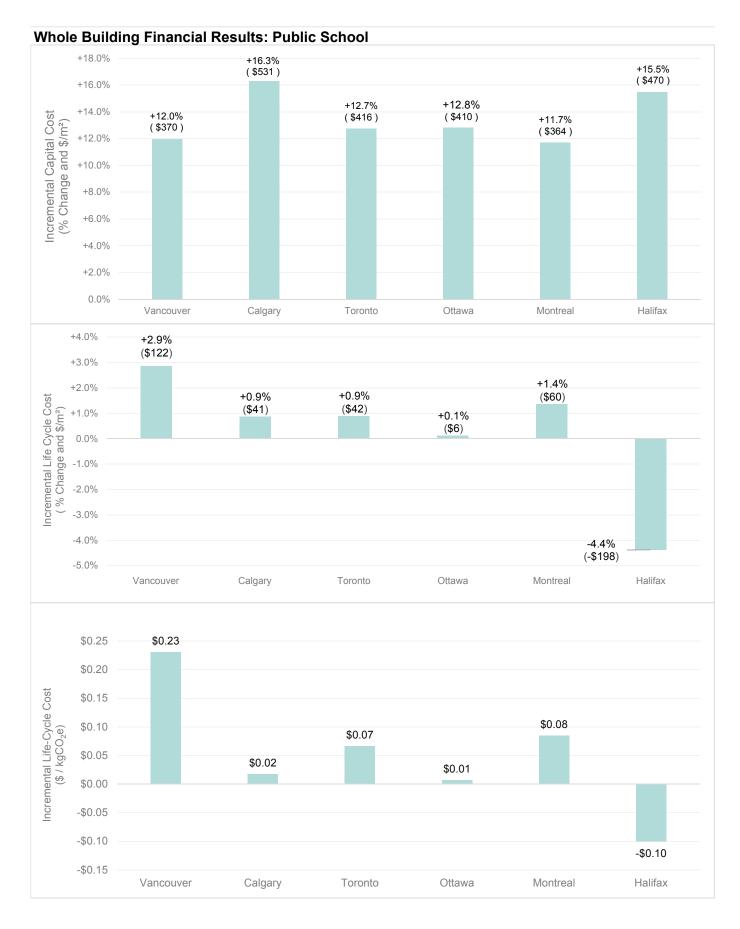
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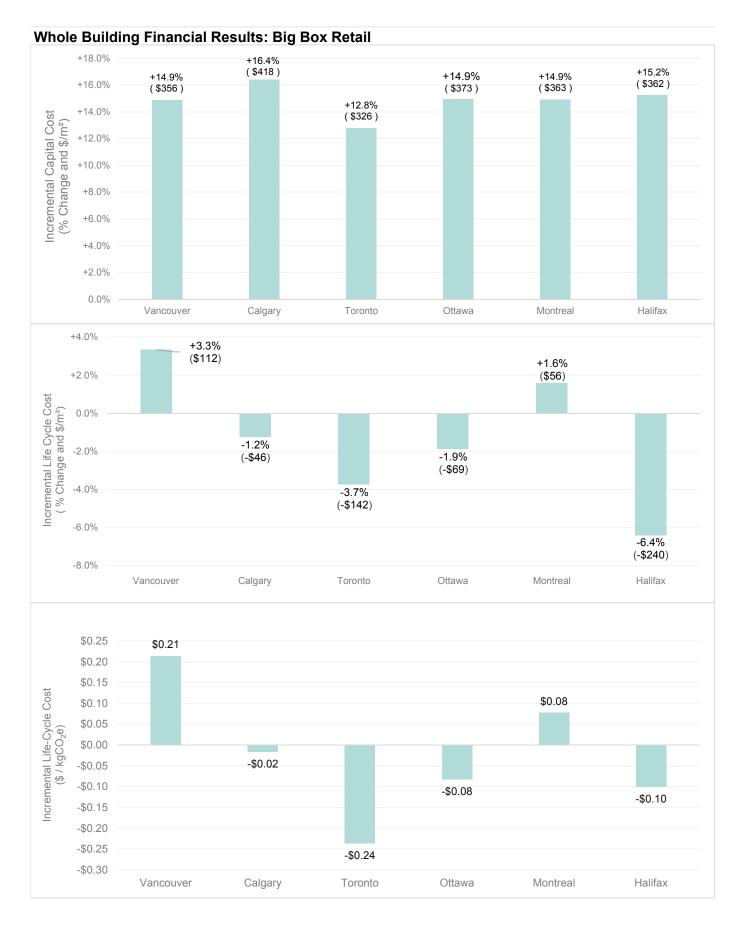
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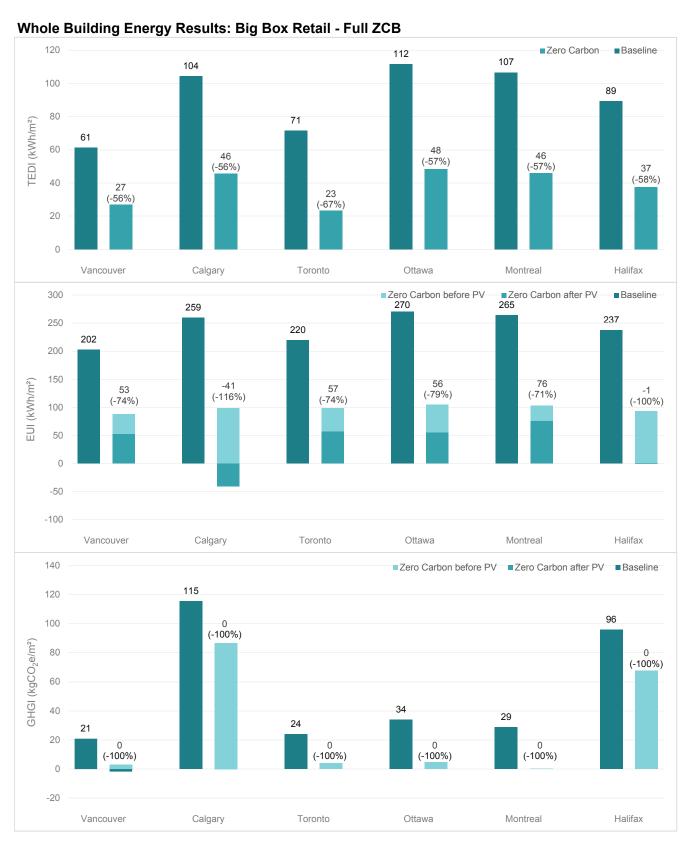


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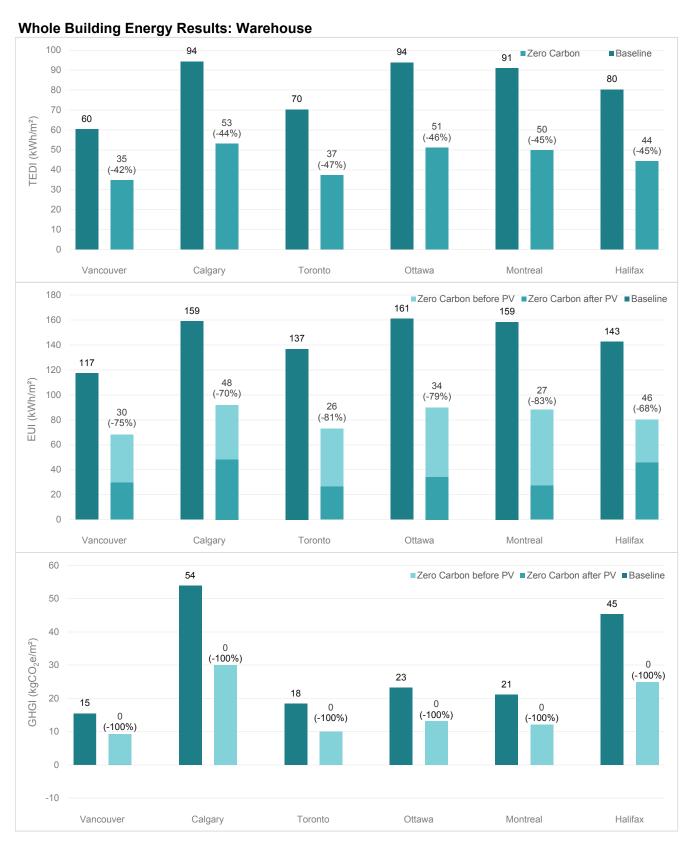


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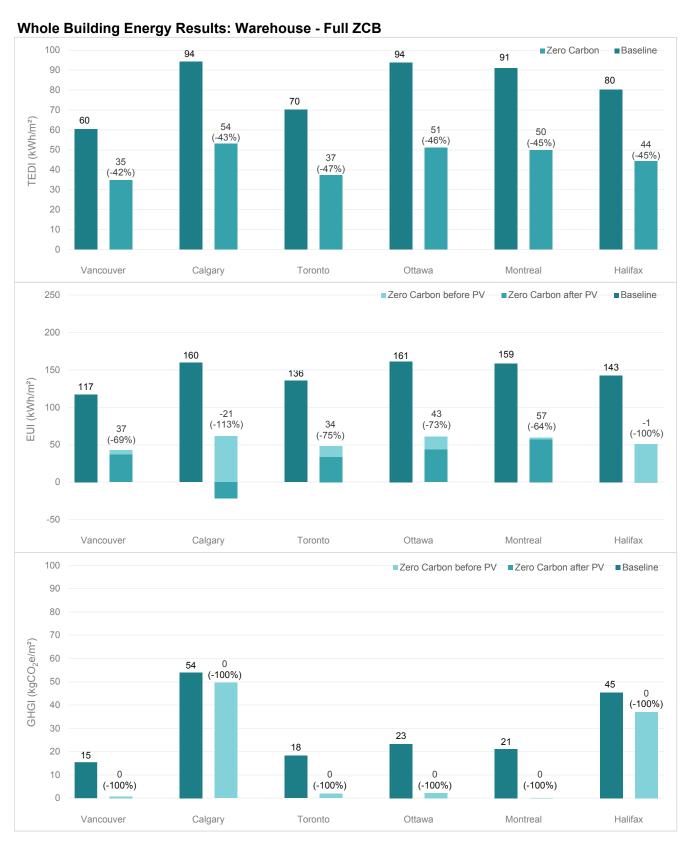


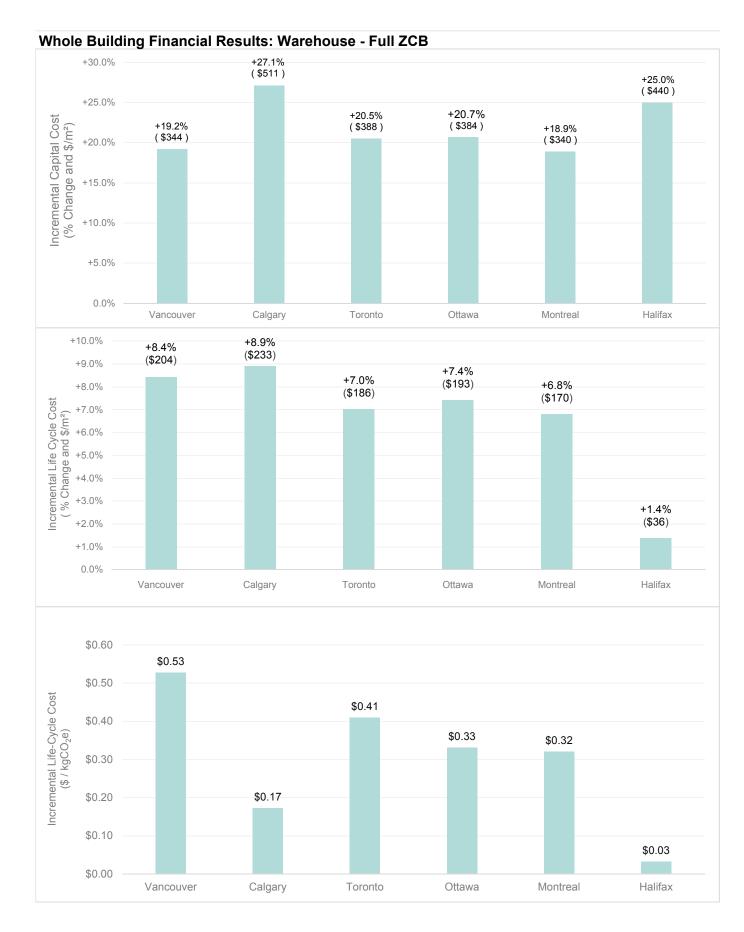
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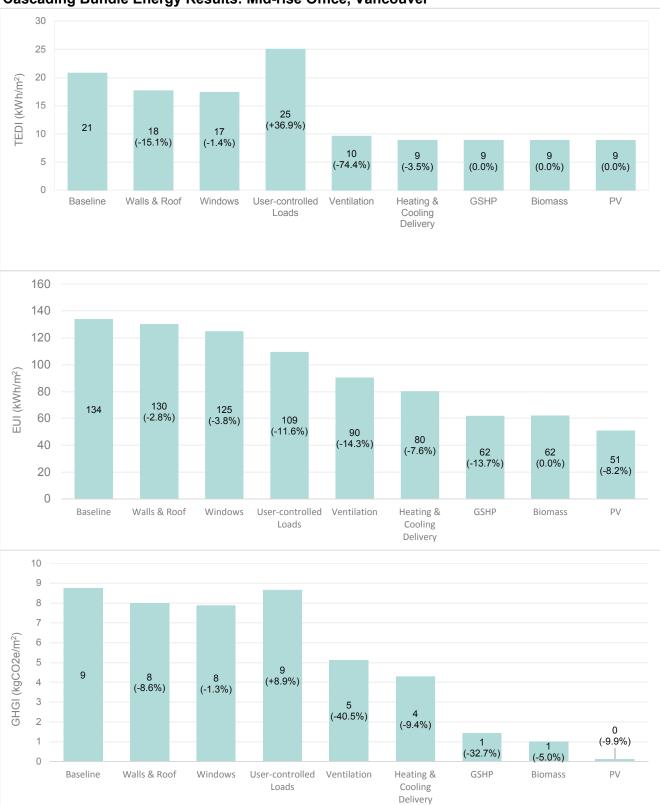
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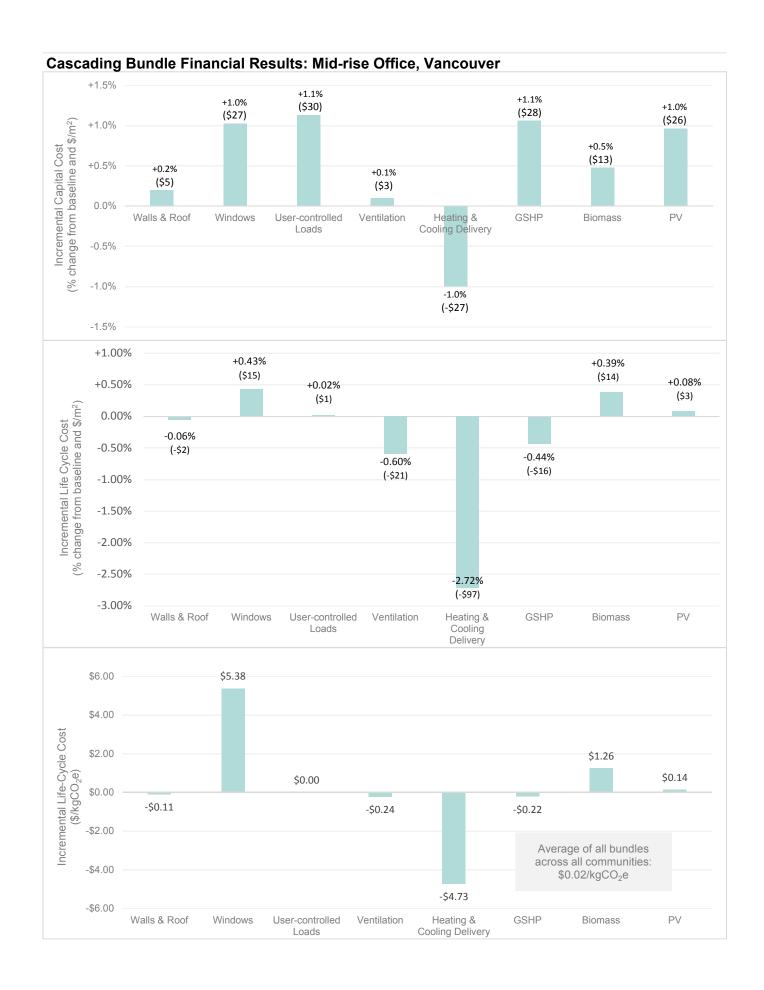




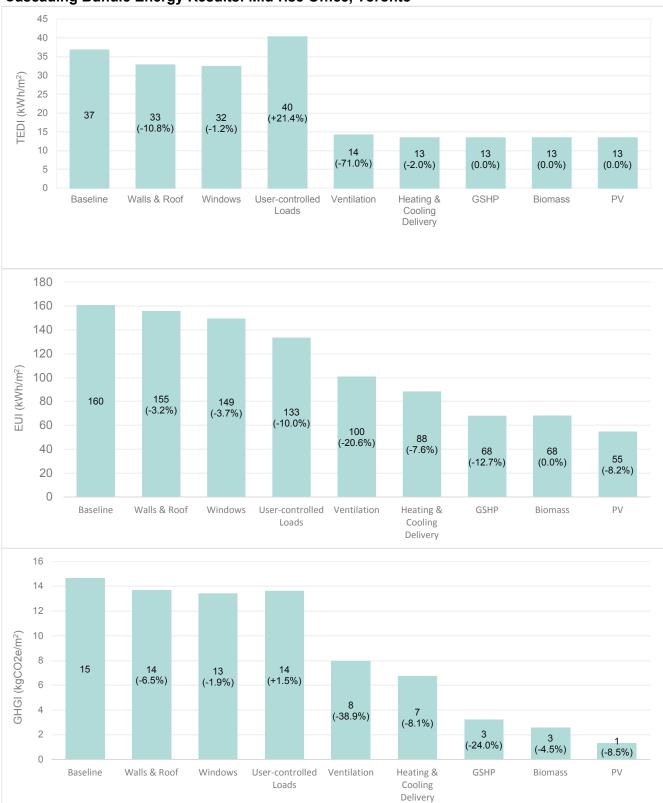
# **B-2** CASCADING BUNDLE RESULTS

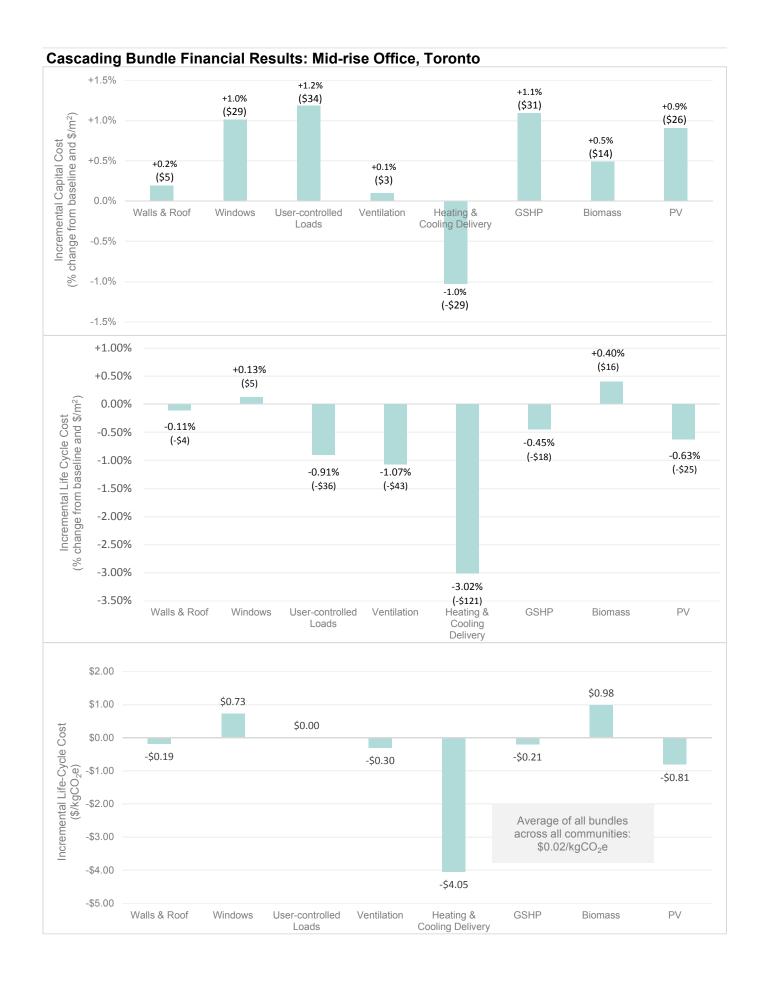




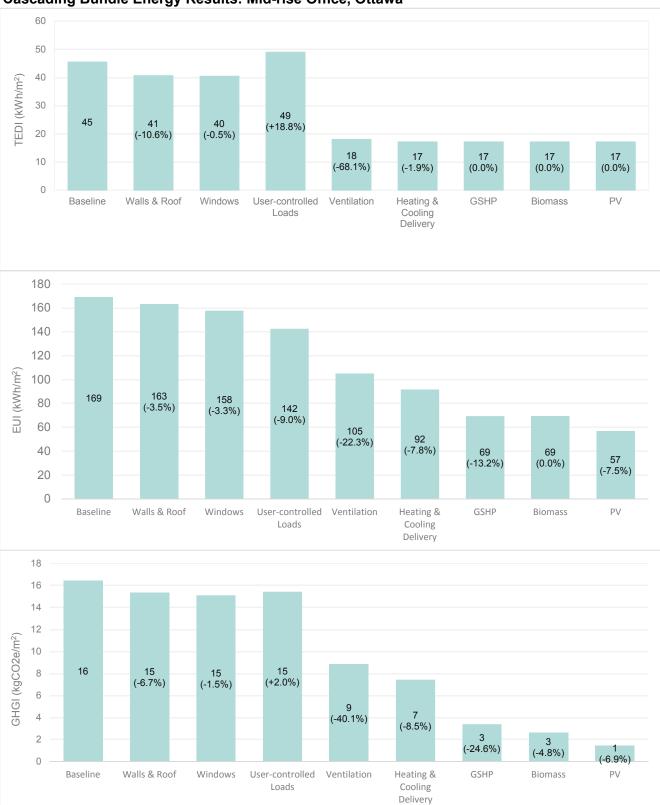


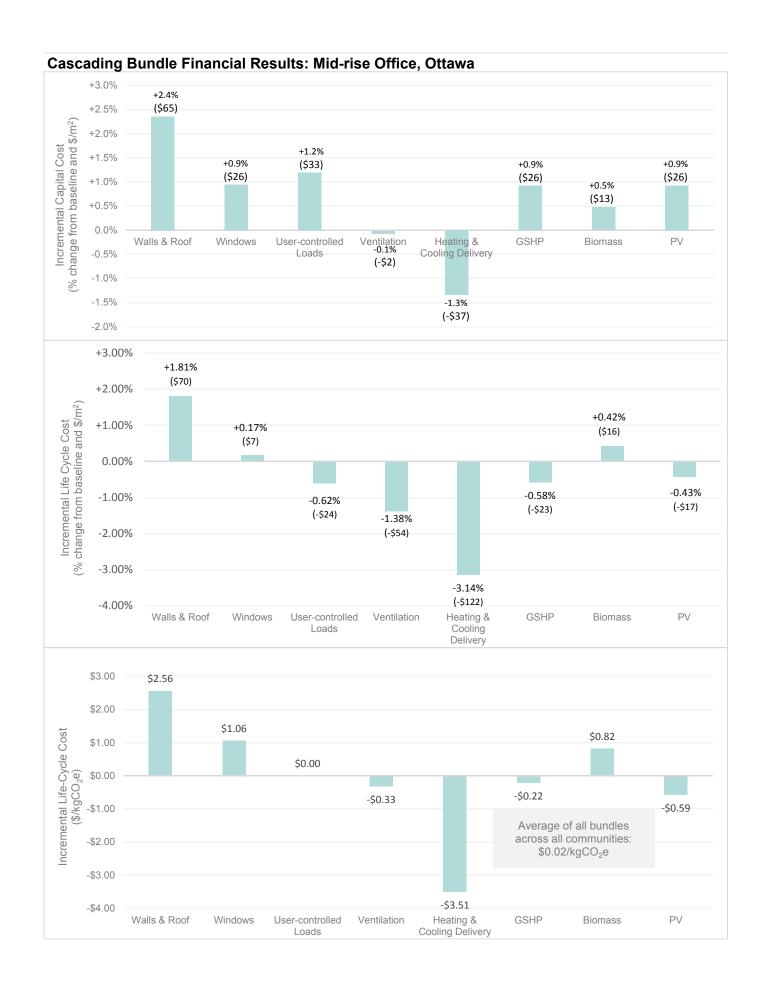


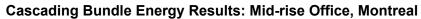


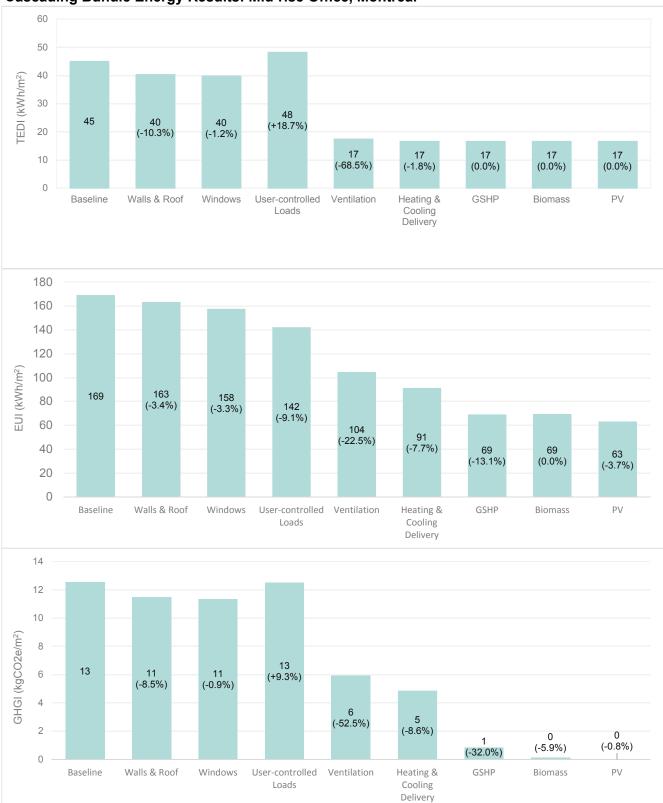


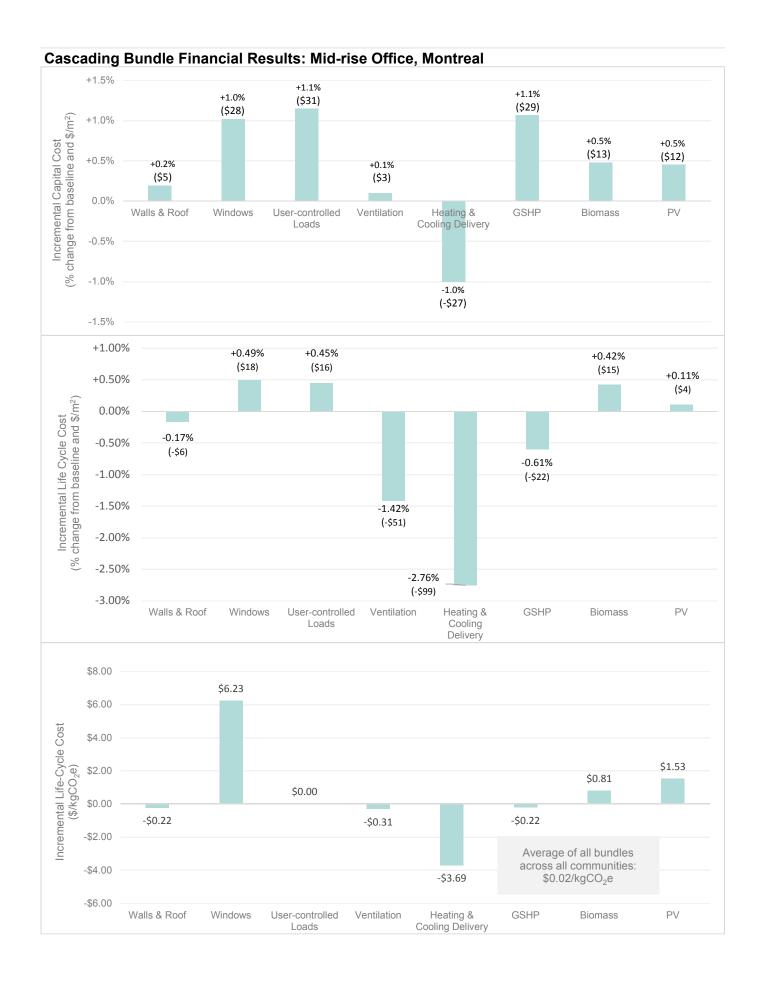




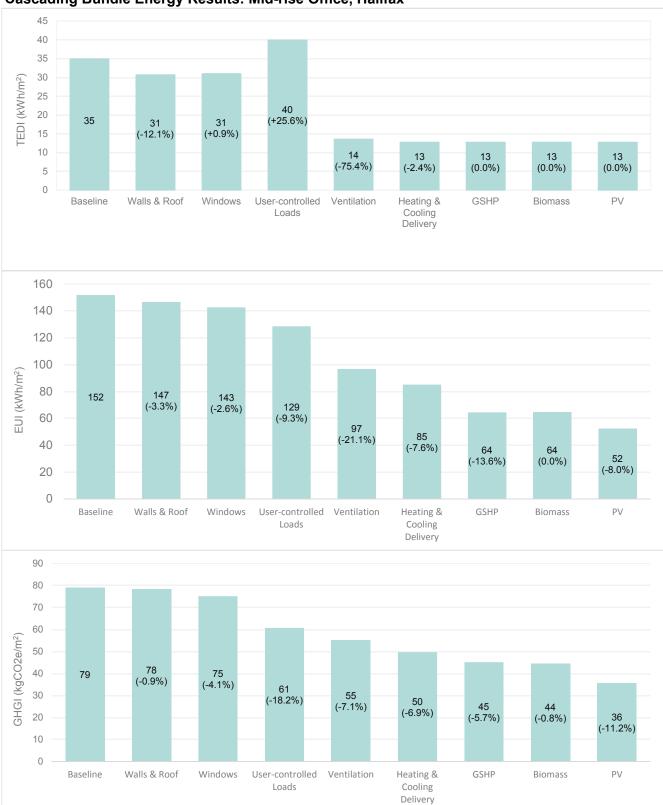


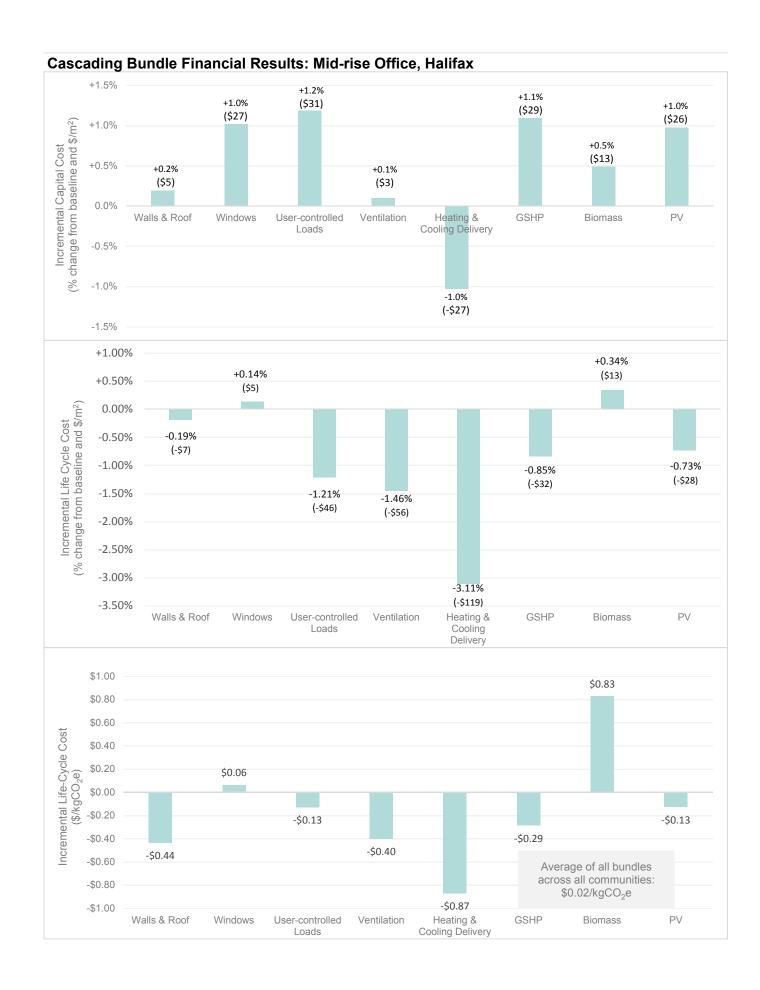




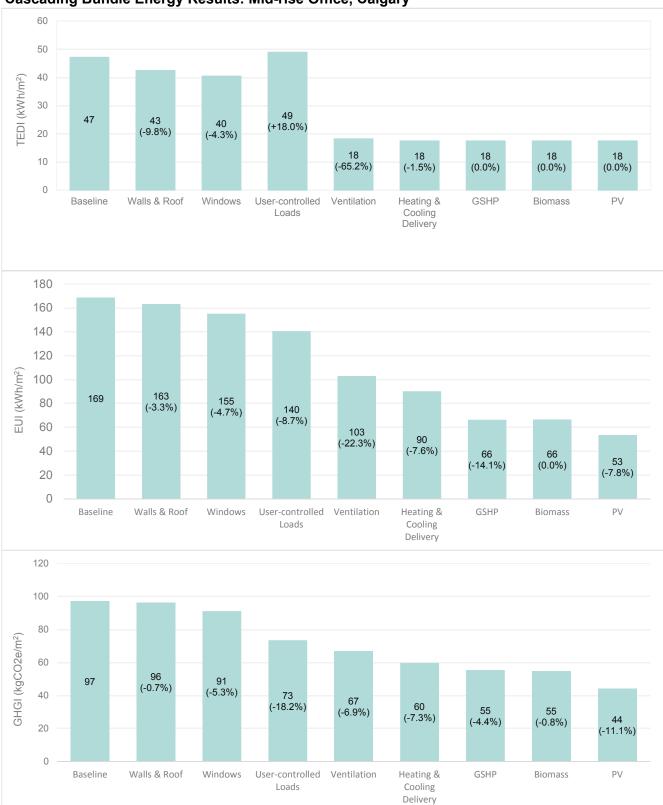


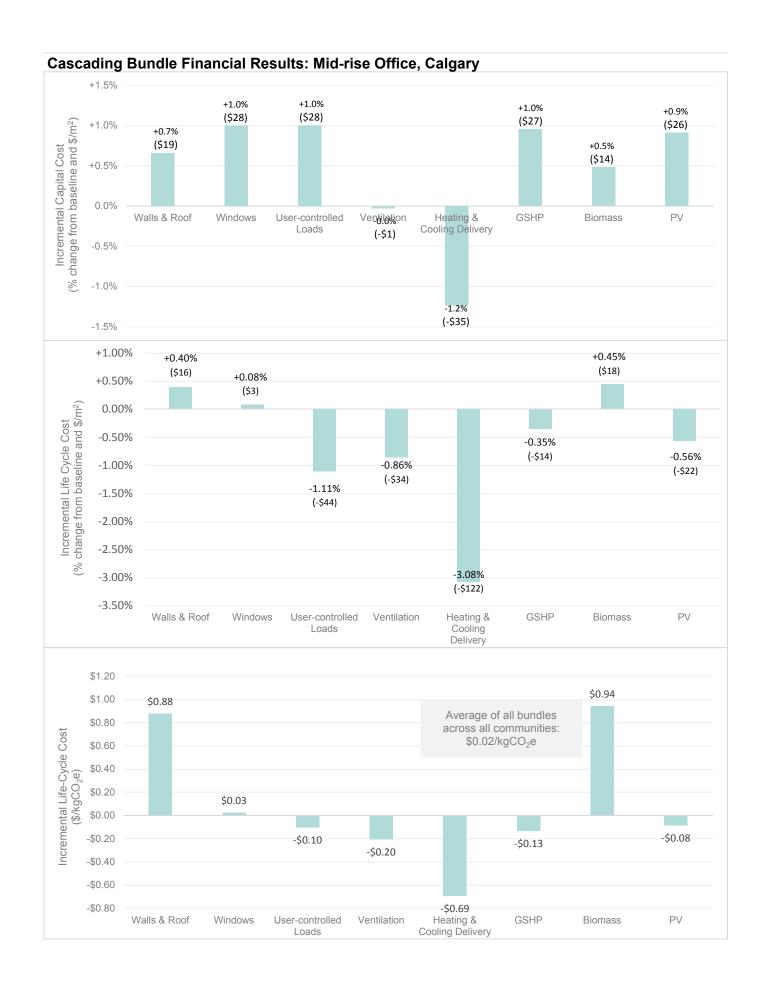






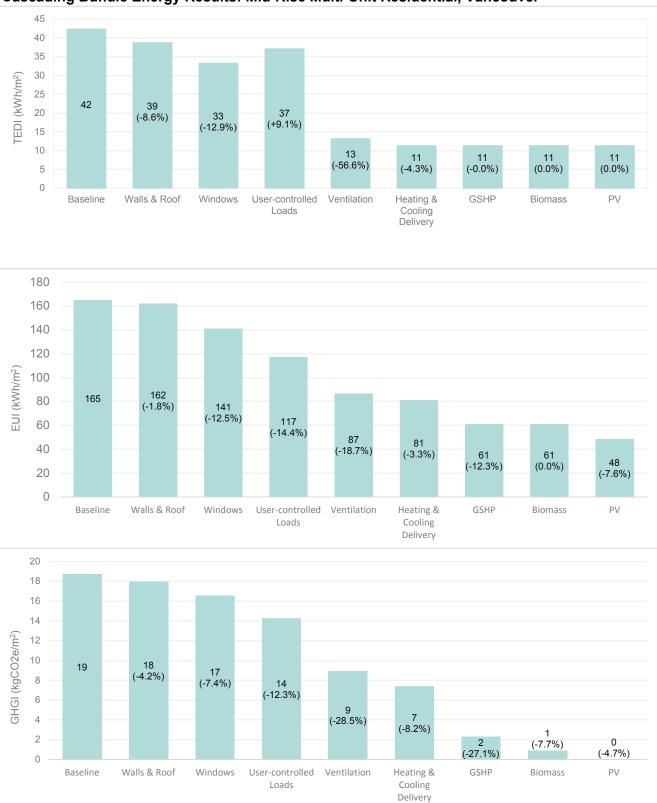


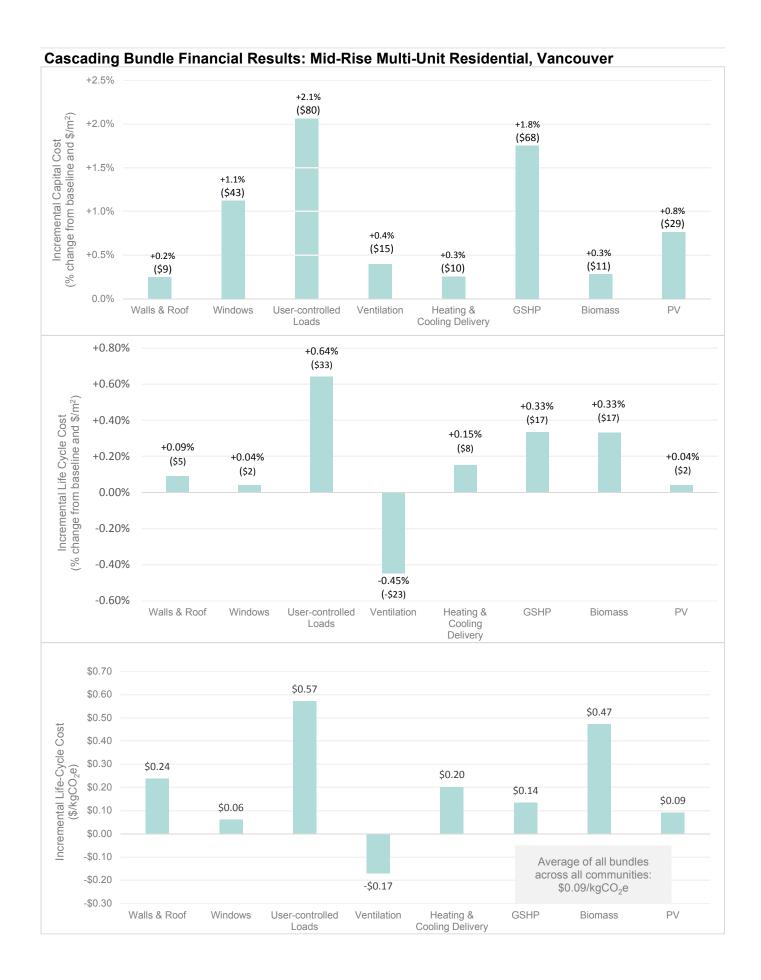




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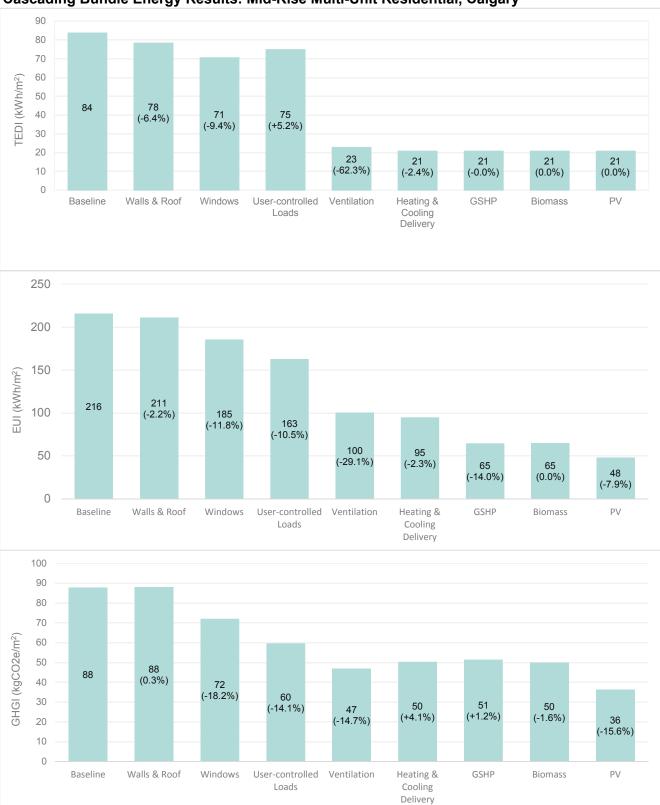


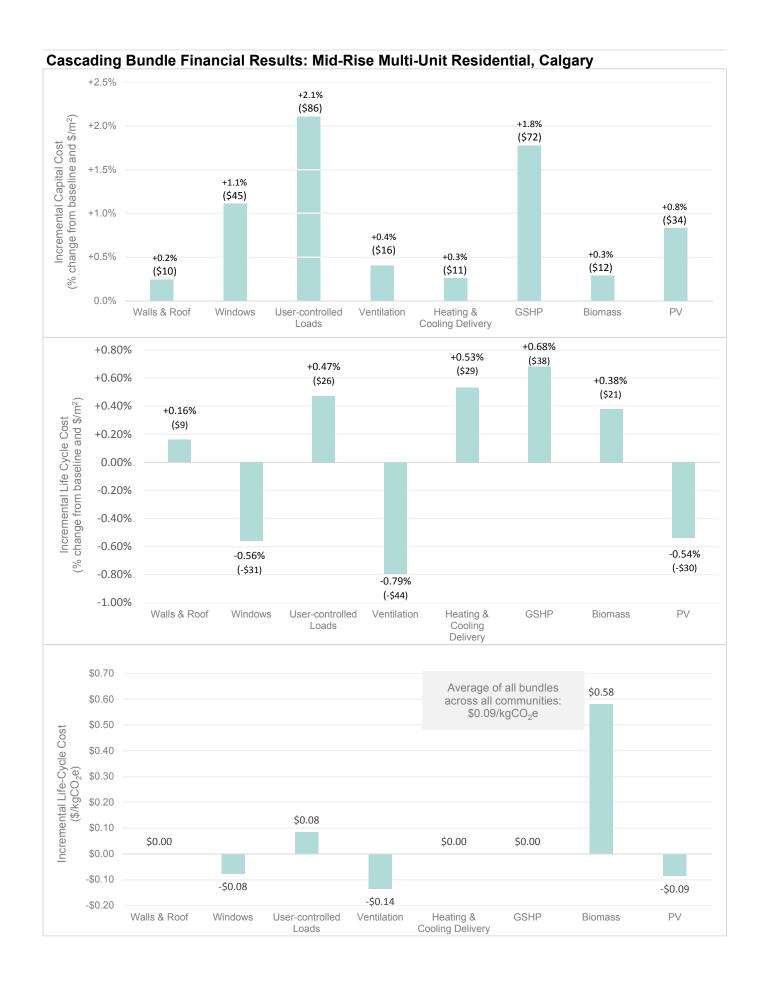




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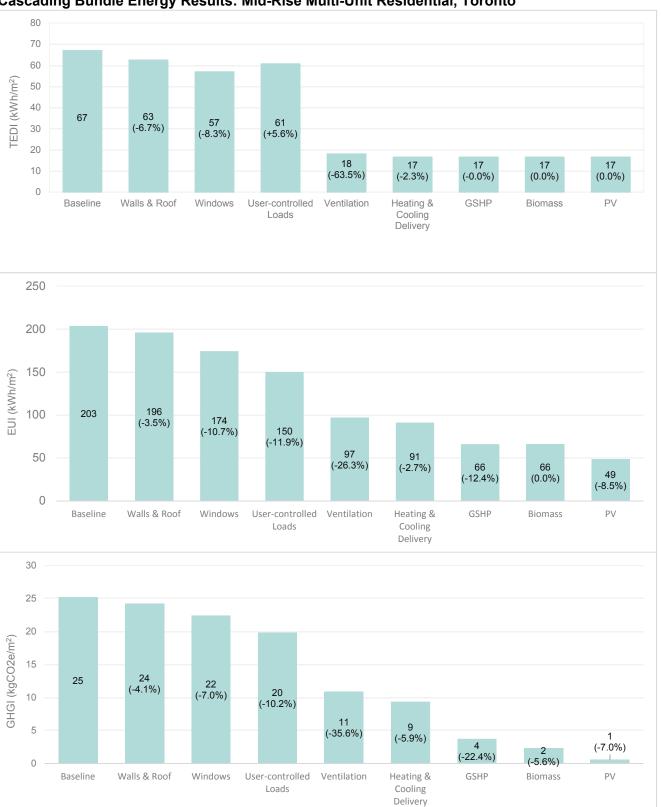


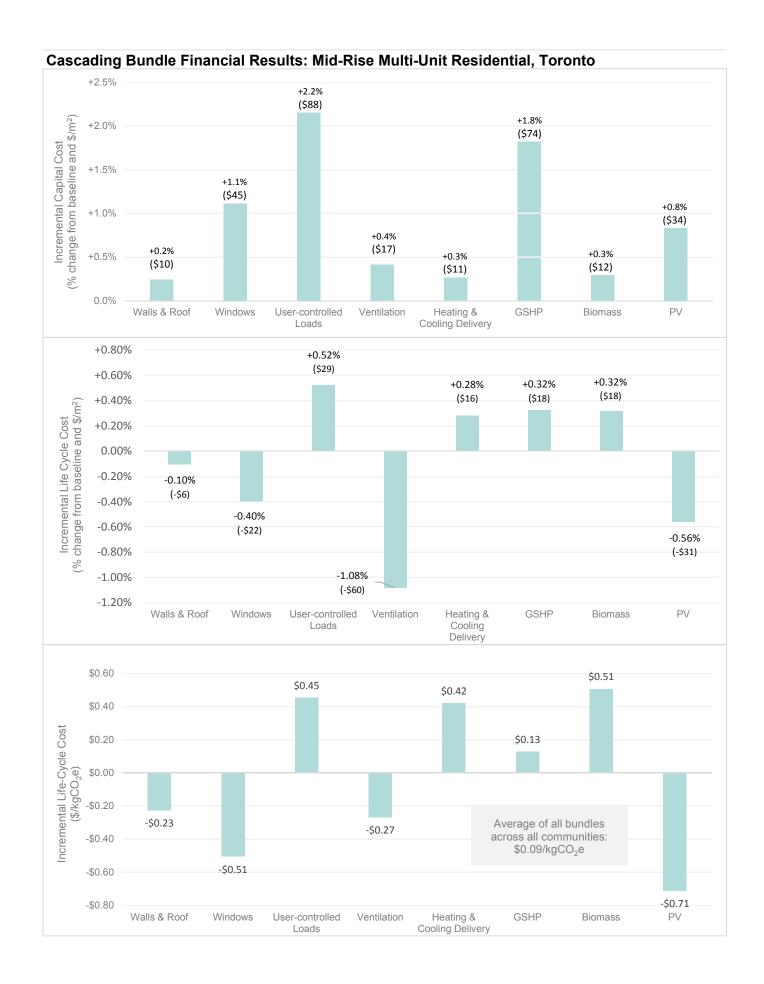




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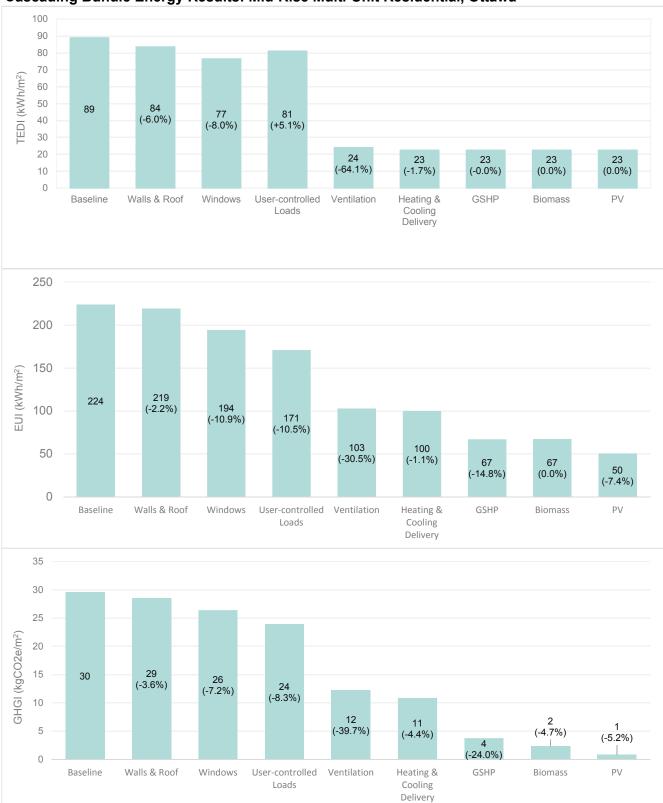


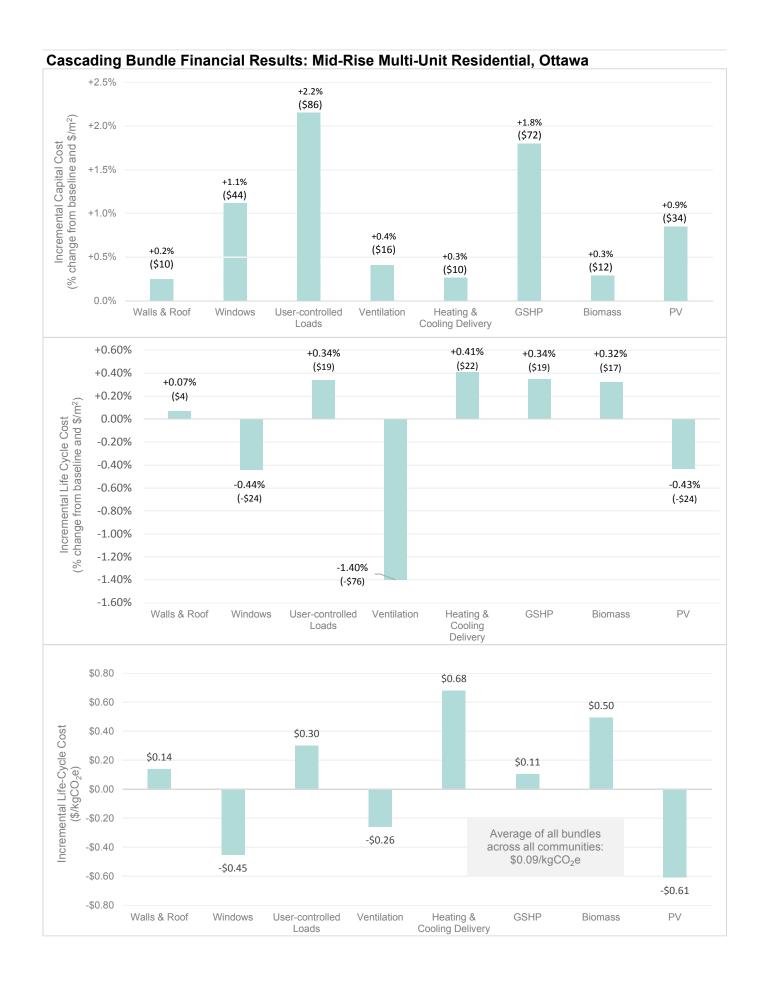




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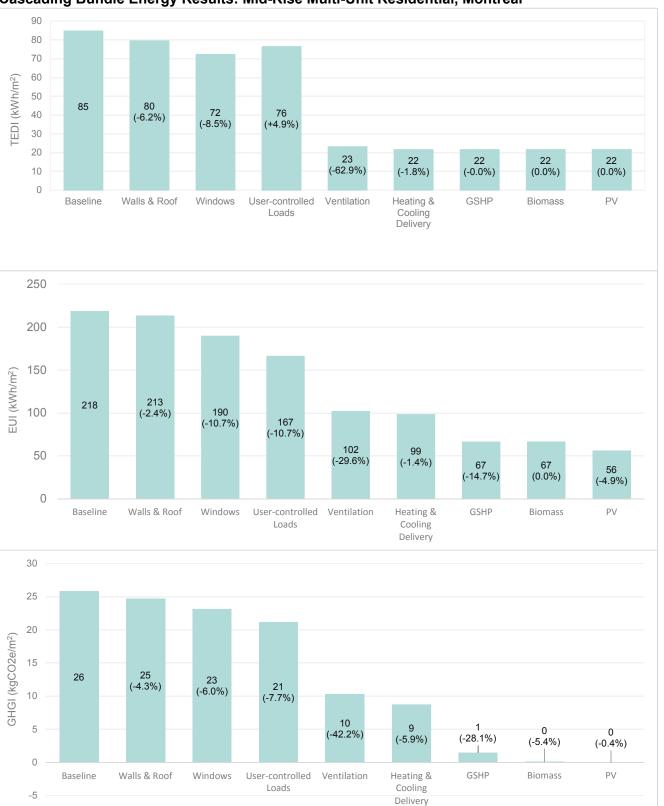


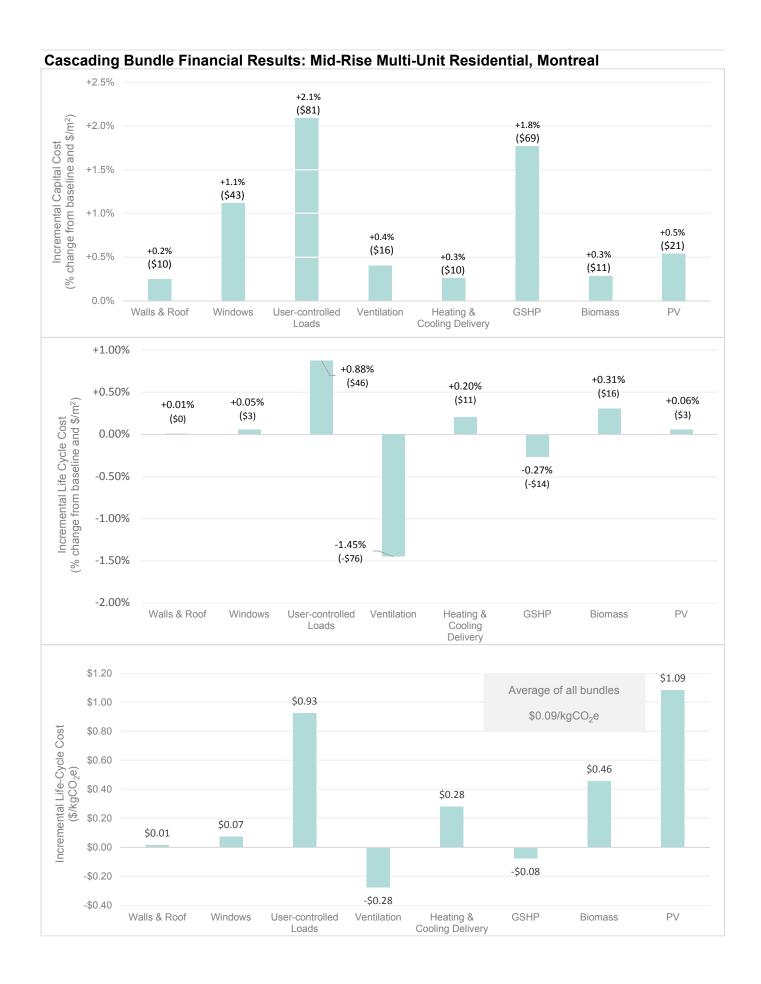




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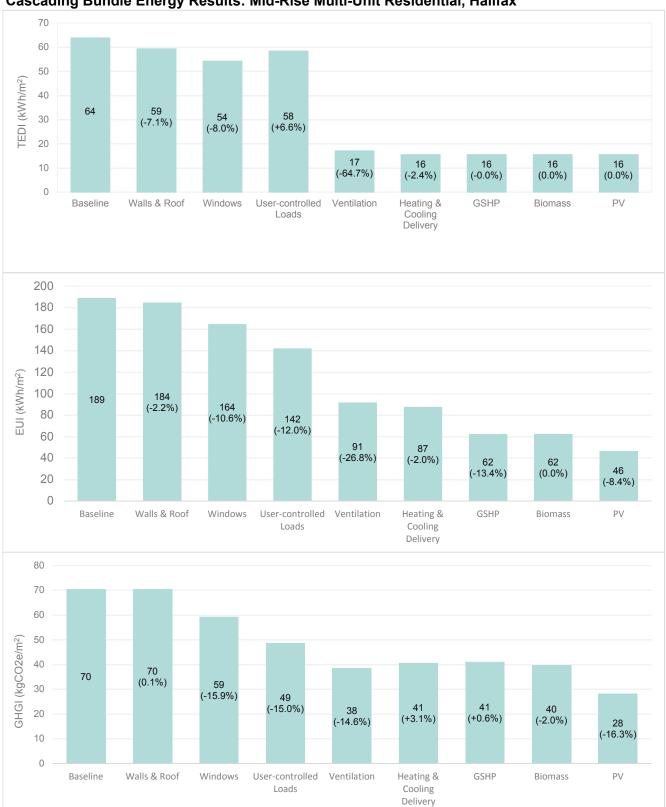


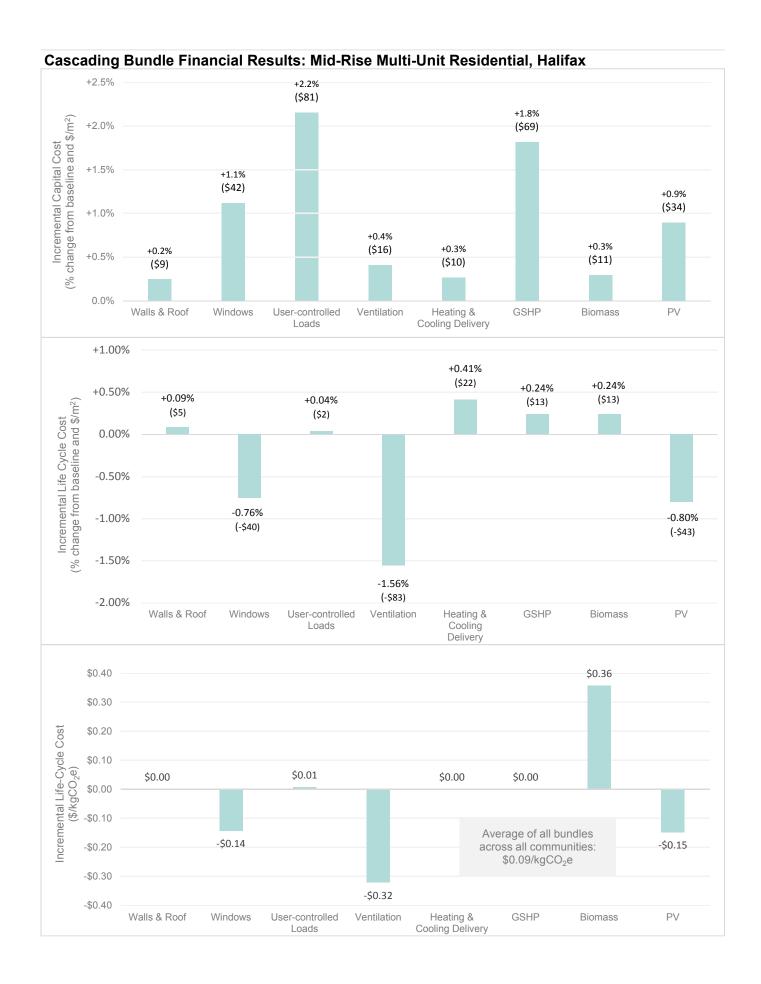




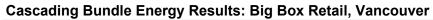
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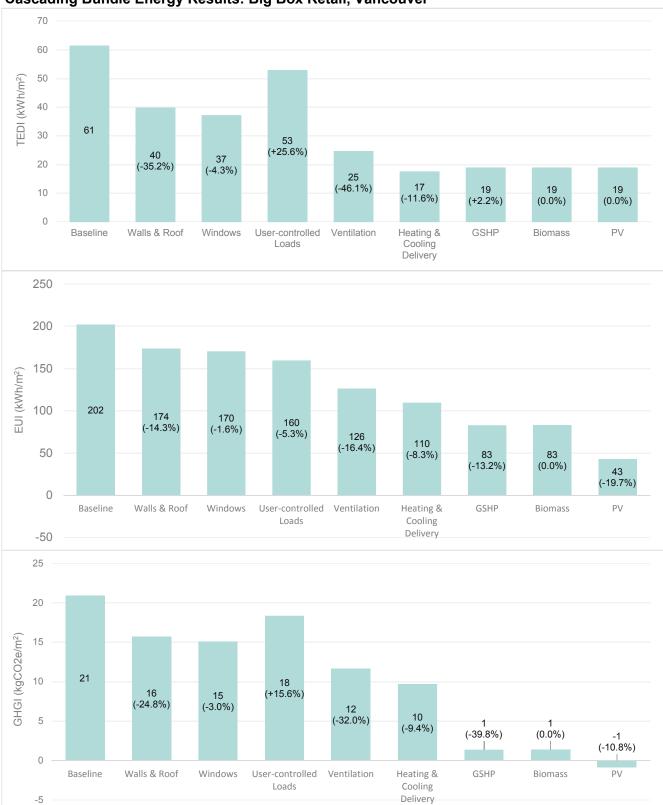


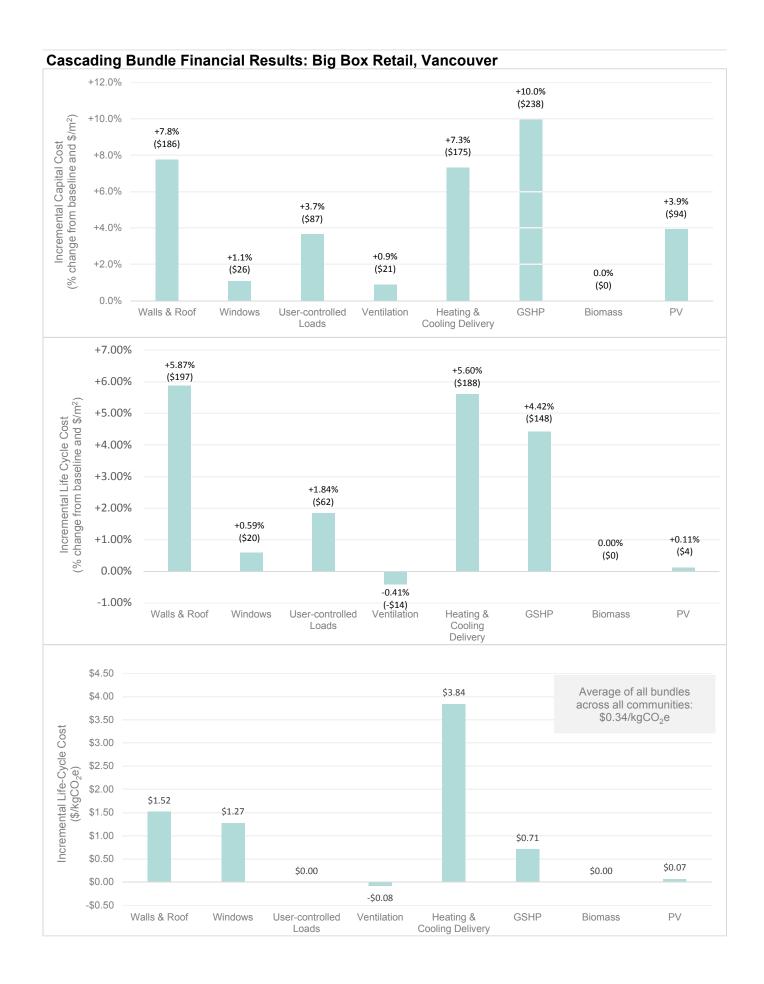




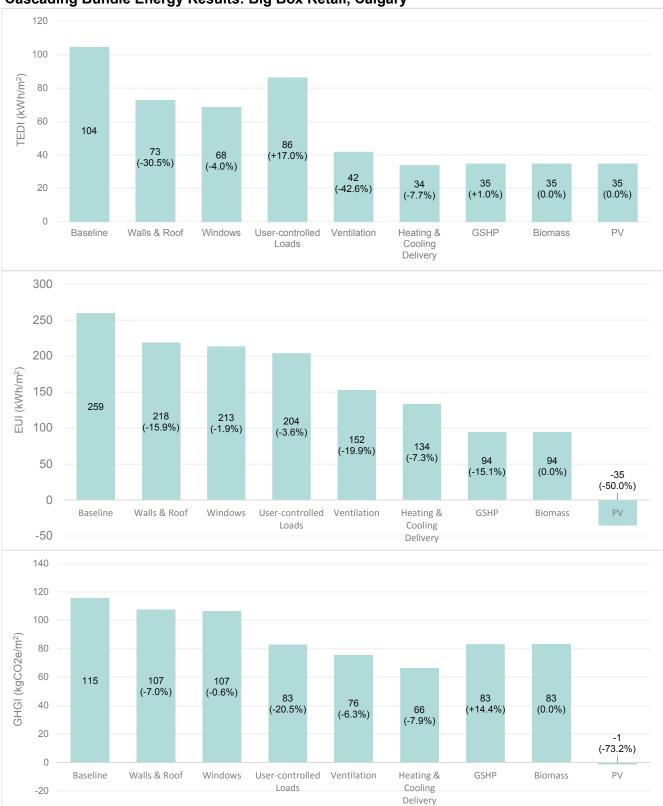
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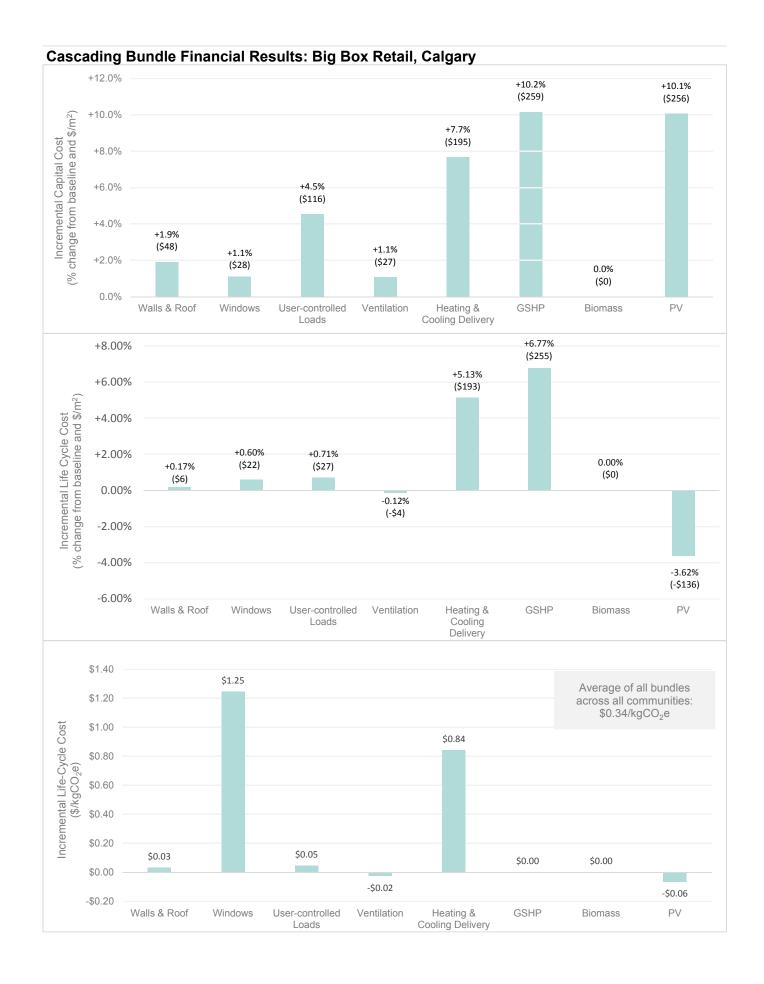




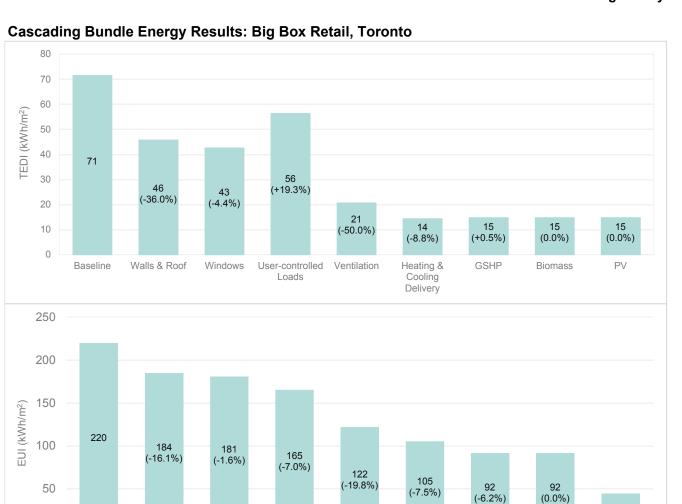


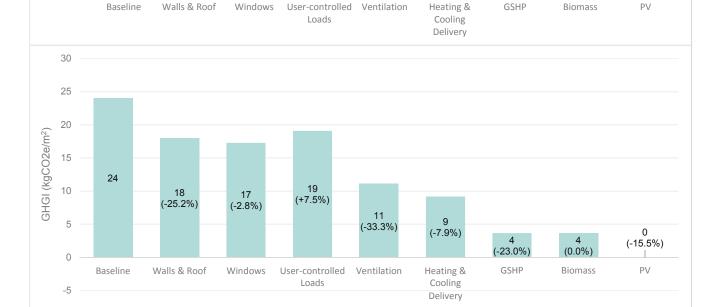


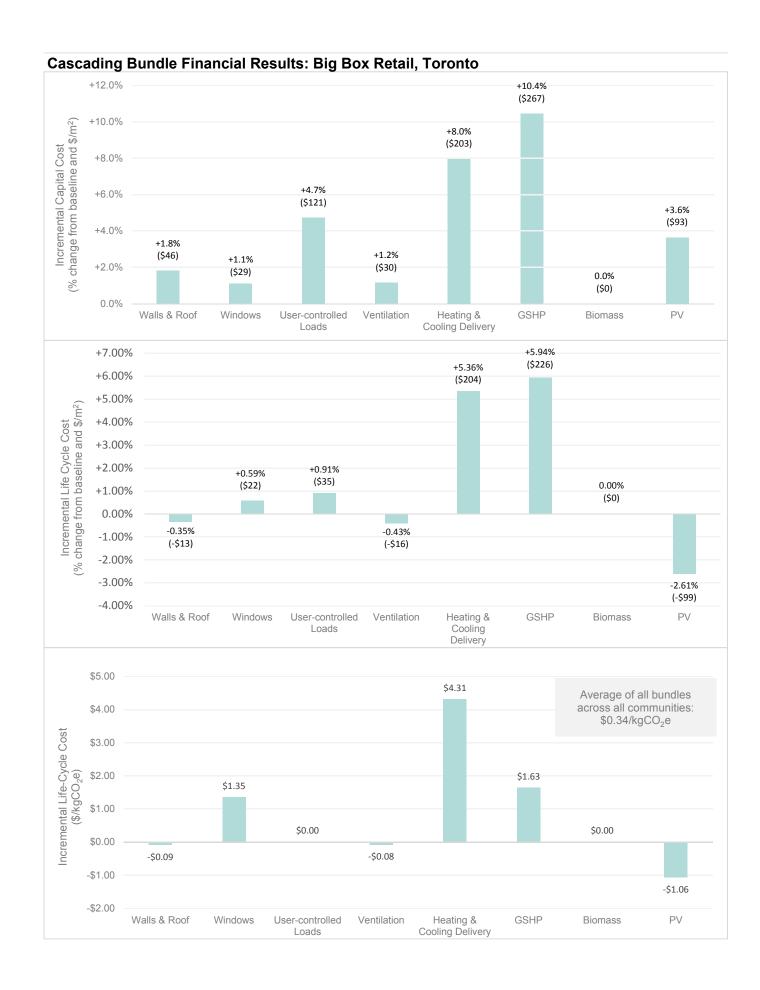




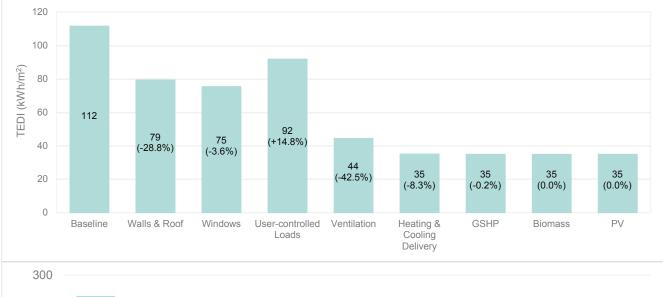
44 (-21.6%)

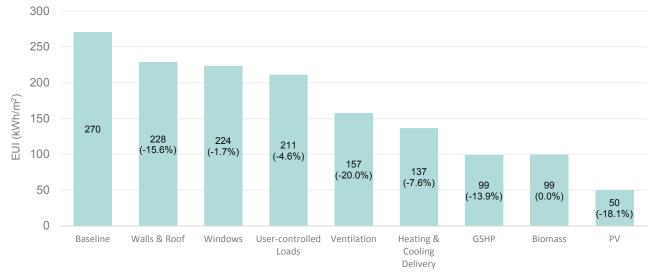


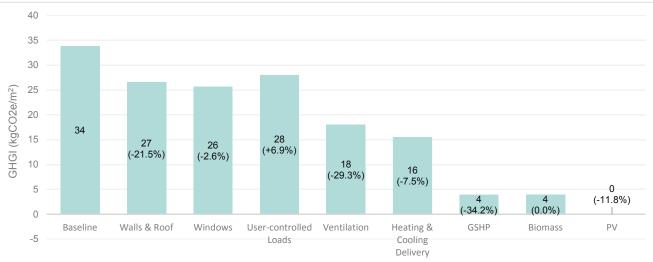


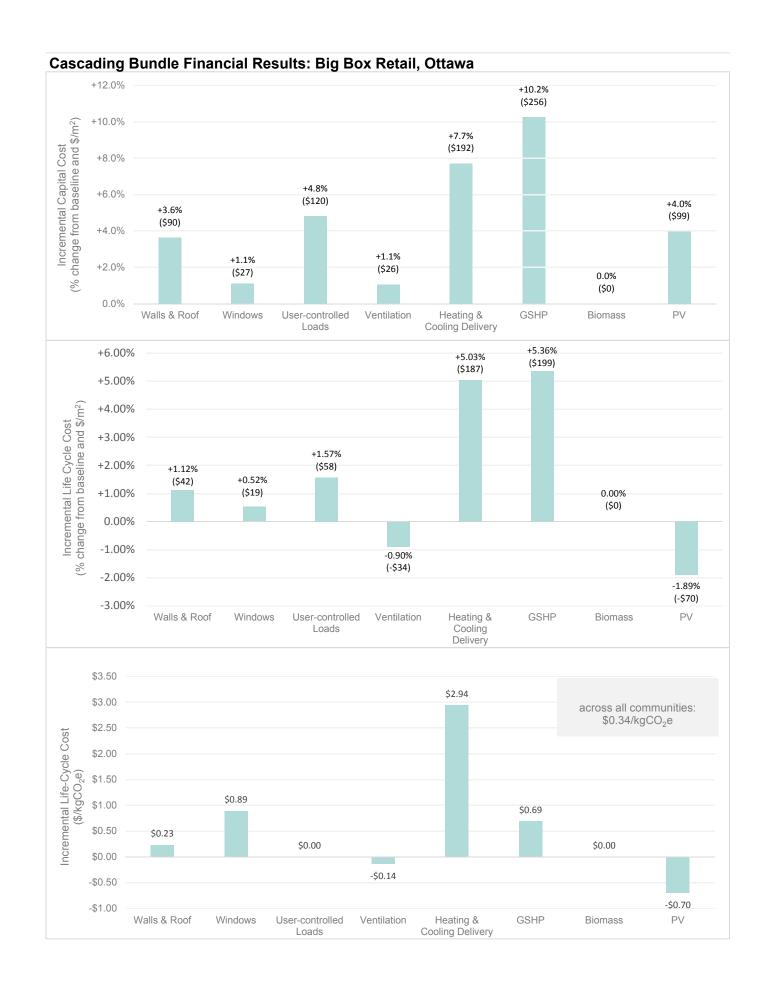


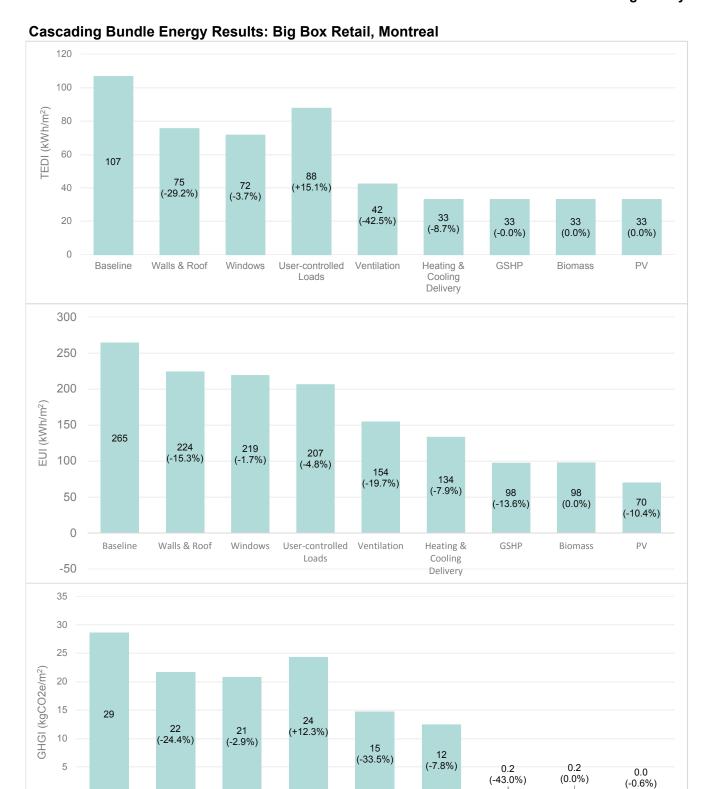












Heating &

Cooling

Delivery

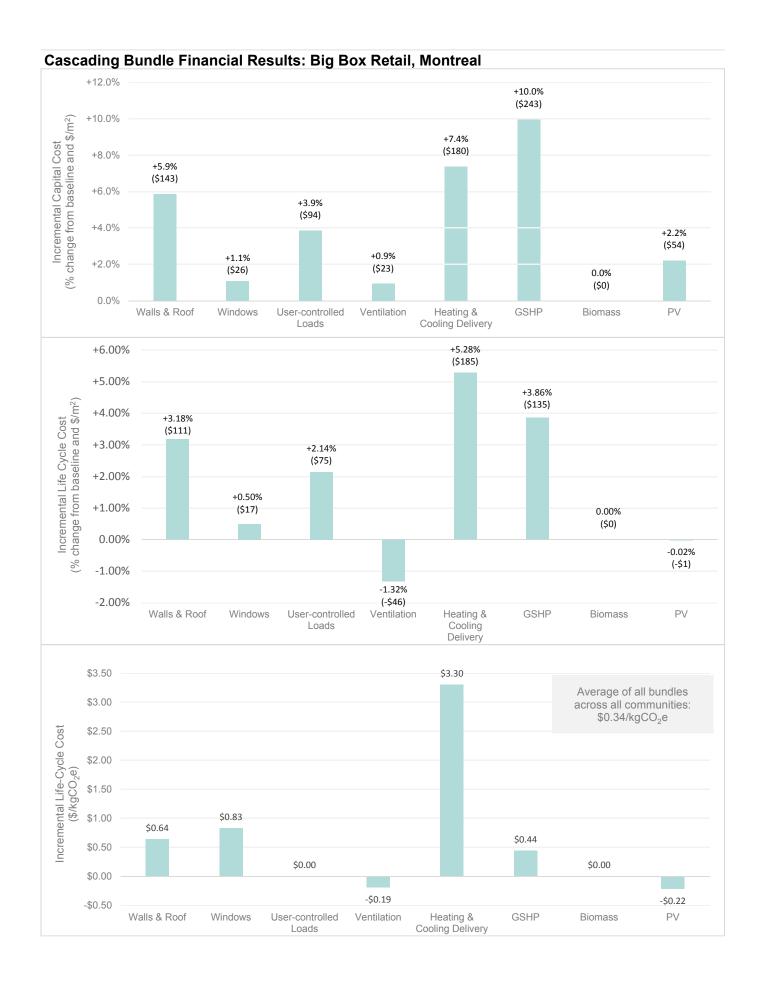
GSHP

Biomass

PV

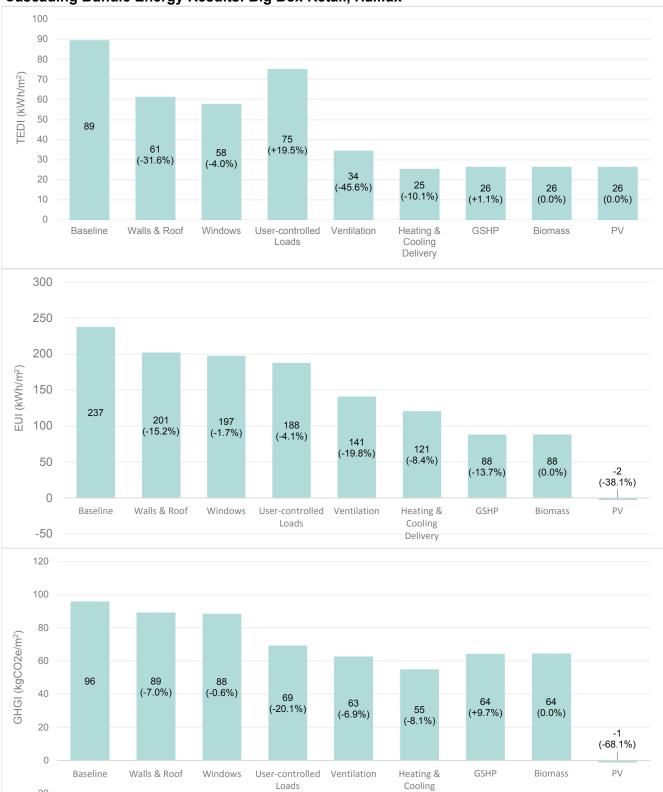
Baseline Walls & Roof Windows User-controlled Ventilation

Loads

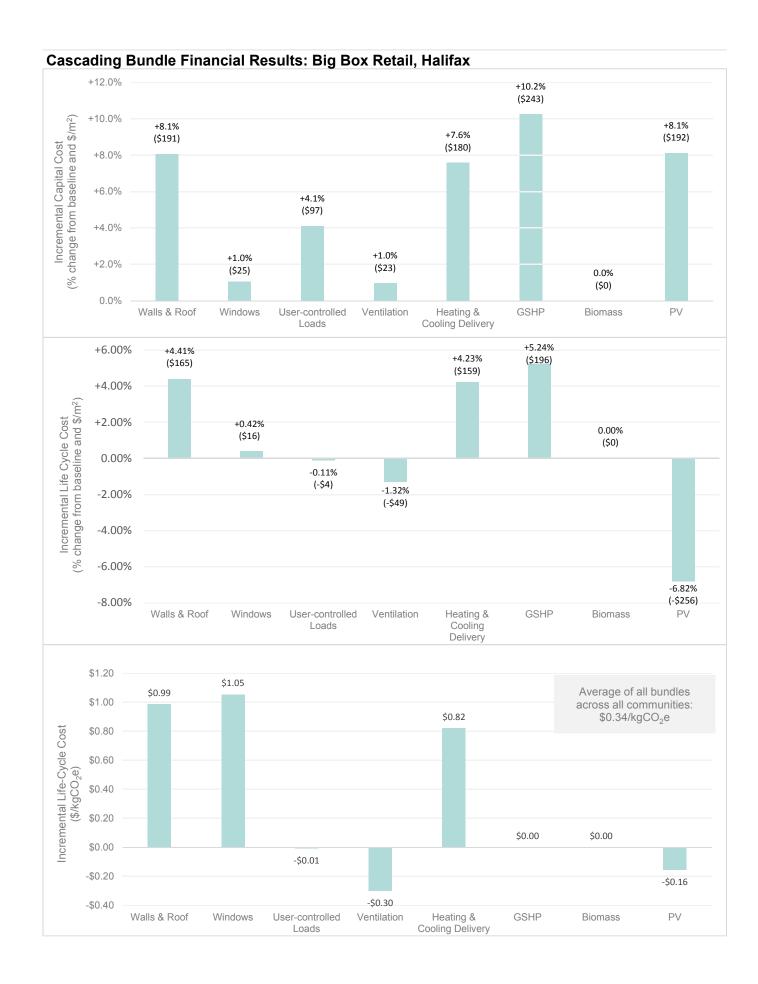




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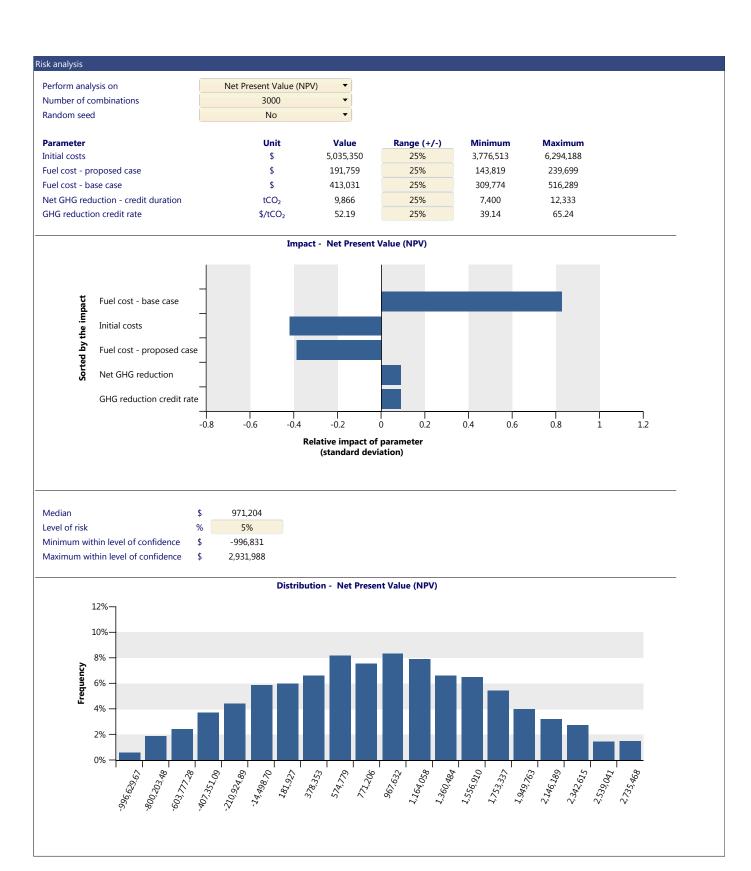
Delivery



### **B-3** SENSITIVITY ANALYSIS

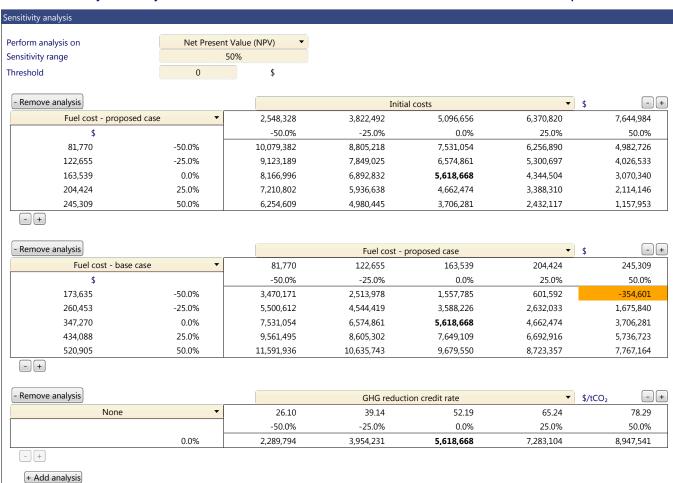
#### MID-RISE OFFICE - VANCOUVER

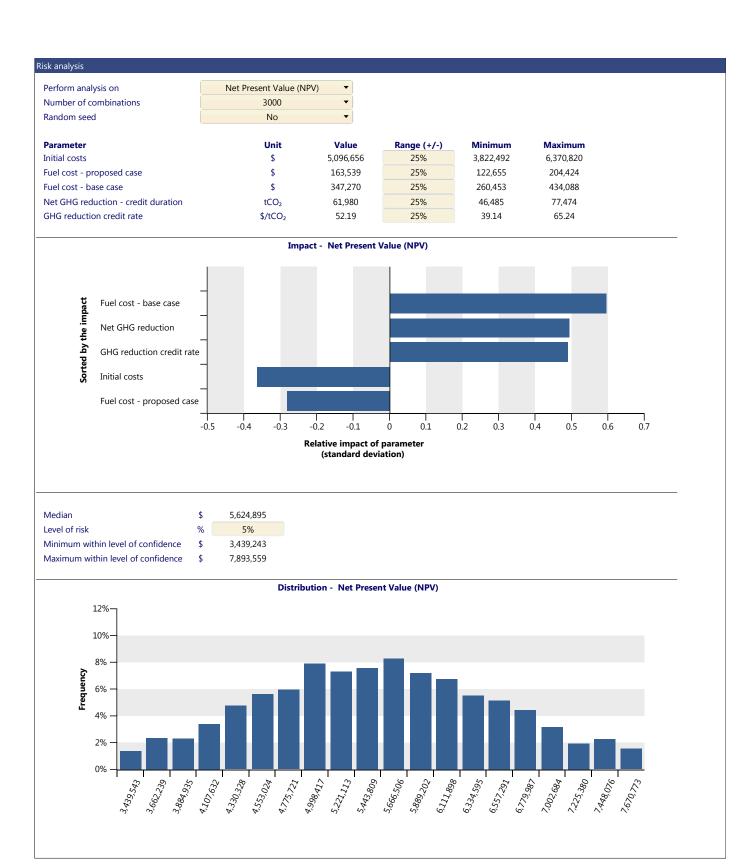
nsitivity analysis						
erform analysis on	Net Present V	alue (NPV) ▼				
ensitivity range	50'	%				
nreshold	0	\$				
- Remove analysis			Initial	costs	▼	\$ -
Fuel cost - proposed case	▼	2,517,675	3,776,513	5,035,350	6,294,188	7,553,025
\$		-50.0%	-25.0%	0.0%	25.0%	50.0%
95,880	-50.0%	5,716,474	4,457,636	3,198,799	1,939,961	681,124
143,819	-25.0%	4,595,283	3,336,445	2,077,608	818,770	-440,067
191,759	0.0%	3,474,092	2,215,254	956,417	-302,421	-1,561,258
239,699	25.0%	2,352,901	1,094,063	-164,774	-1,423,612	-2,682,449
287,639	50.0%	1,231,710	-27,127	-1,285,965	-2,544,802	-3,803,640
Remove analysis  Fuel cost - base case	▼	95.880		roposed case	239 699	<u> </u>
Fuel cost - base case	▼	95,880	143,819	191,759	239,699	287,639
\$	50.00/	-50.0%	-25.0%	0.0%	25.0%	50.0%
206,516	-50.0%	-1,631,079	-2,752,270	-3,873,460	-4,994,651	-6,115,842
309,774	-25.0%	783,860	-337,331	-1,458,522	-2,579,713	-3,700,904
413,031	0.0%	3,198,799	2,077,608	956,417	-164,774	-1,285,965
516,289	25.0%	5,613,737	4,492,546	3,371,355	2,250,165	1,128,974
619,547	50.0%	8,028,676	6,907,485	5,786,294	4,665,103	3,543,912
Remove analysis			CHC raduction	on credit rate	▼	\$/tCO <sub>2</sub>
	▼	26.10	39.14	52.19	65.24	78.29
None		-50.0%	-25.0%	0.0%	25.0%	50.0%
None		30.070				1,486,322
None	0.0%	426,512	691,464	956,417	1,221,369	



#### MID-RISE OFFICE - CALGARY

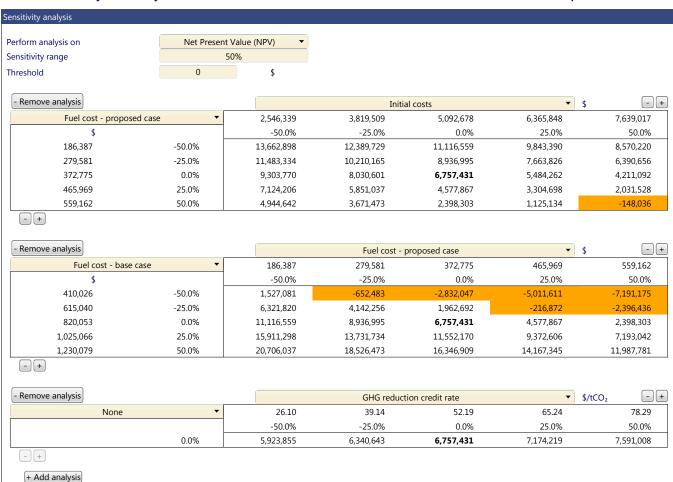
#### **RETScreen - Sensitivity & Risk Analysis**

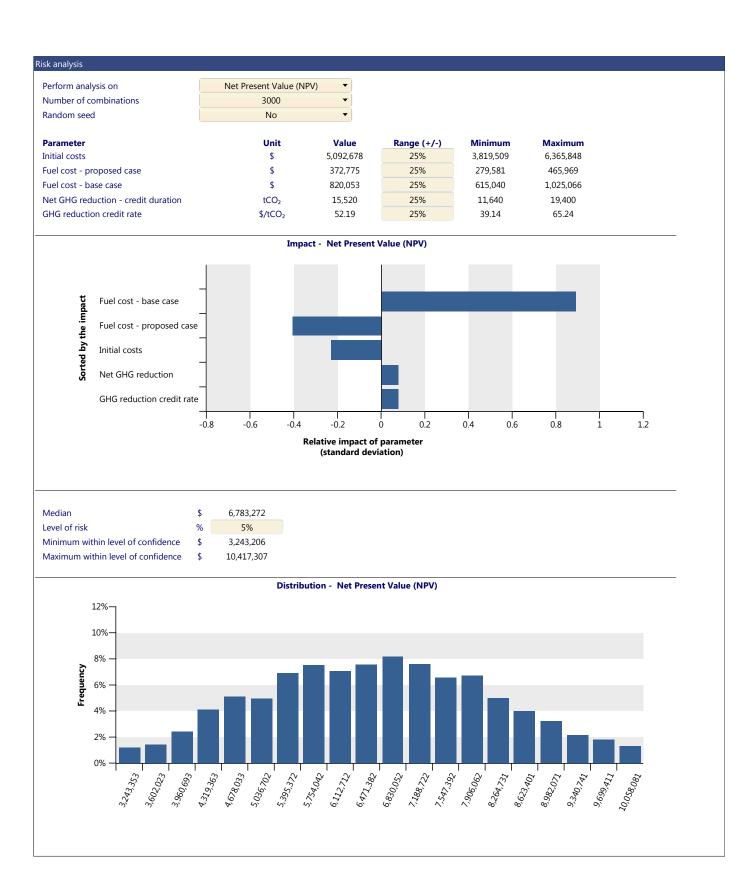




#### **MID-RISE OFFICE - TORONTO**

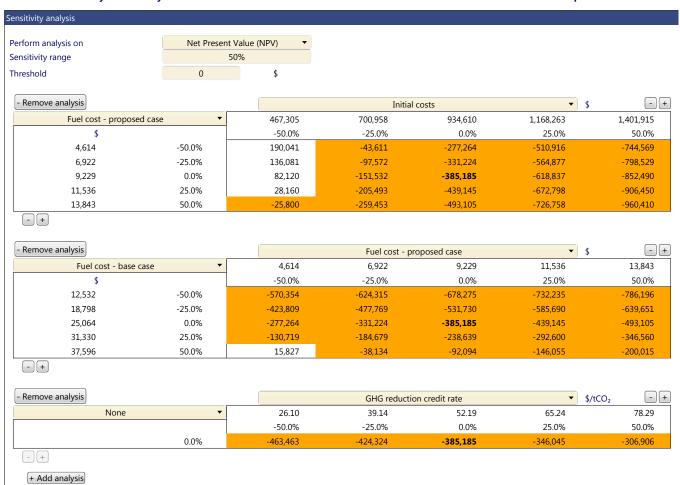
#### **RETScreen - Sensitivity & Risk Analysis**

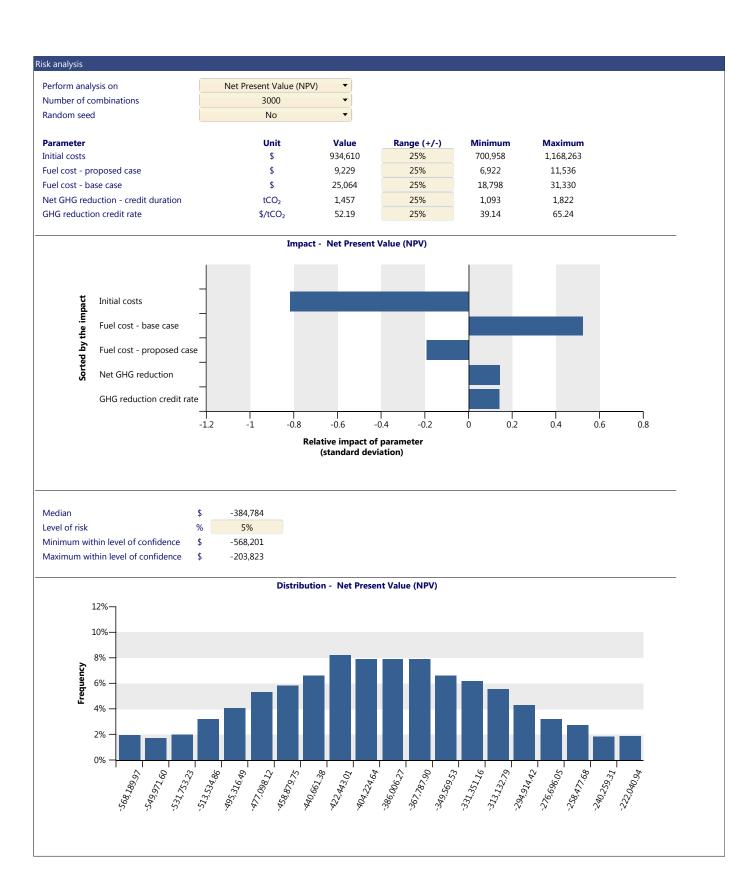




#### LOW-RISE MURB - VANCOUVER

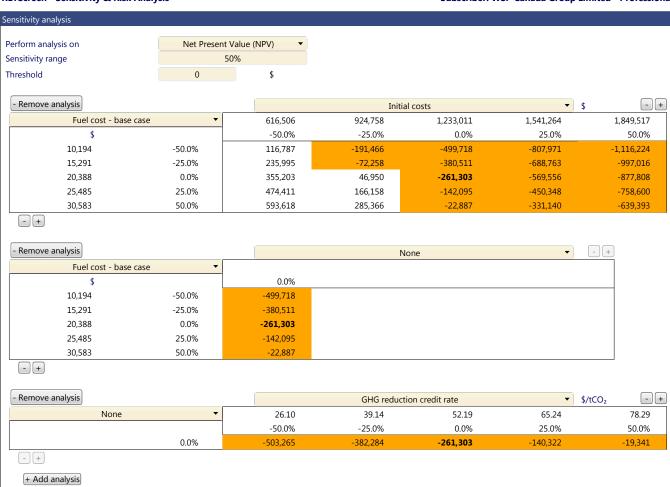
#### **RETScreen - Sensitivity & Risk Analysis**





#### **LOW-RISE MURB - CALGARY**

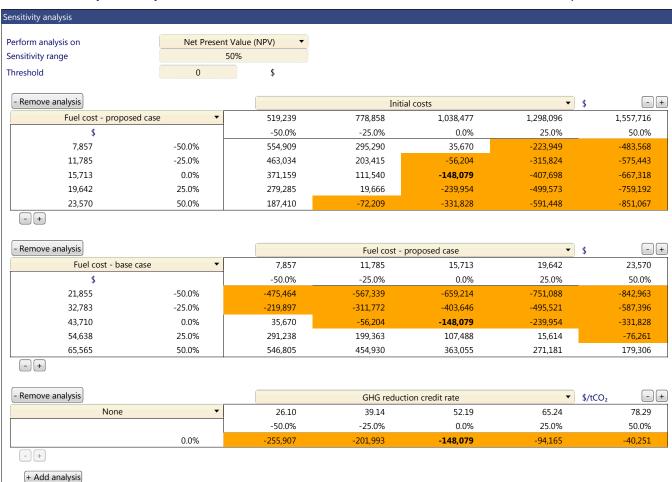
#### **RETScreen - Sensitivity & Risk Analysis**



#### Risk analysis Perform analysis on Net Present Value (NPV) Number of combinations 3000 Random seed No Parameter Unit Value Range (+/-) Maximum Initial costs 1,233,011 25% 924.758 1,541,264 Fuel cost - base case 20,388 25% 15,291 25,485 Net GHG reduction - credit duration $tCO_2$ 4,505 25% 3,379 5,631 GHG reduction credit rate \$/tCO<sub>2</sub> 52.19 25% 39.14 65.24 Impact - Net Present Value (NPV) Initial costs GHG reduction credit rate Net GHG reduction Fuel cost - base case -0.2 -1.2 -0.8 -0.6 Relative impact of parameter (standard deviation) -257,842 Median 5% Level of risk Minimum within level of confidence -498,510 Maximum within level of confidence \$ -20,038 Distribution - Net Present Value (NPV) 12%¬ 10%-8%

#### **LOW-RISE MURB - TORONTO**

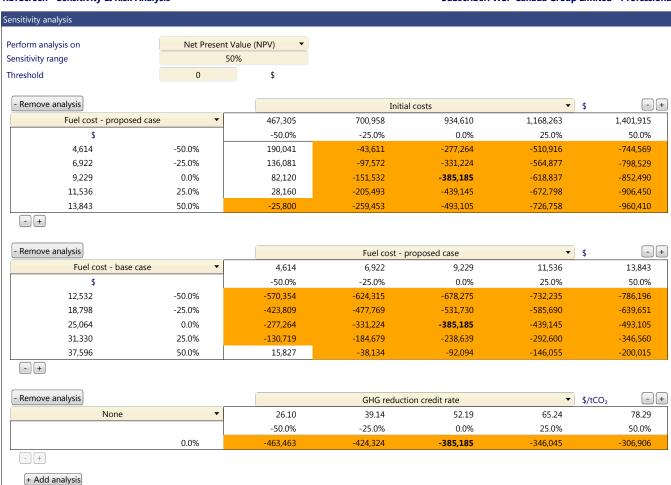
#### **RETScreen - Sensitivity & Risk Analysis**



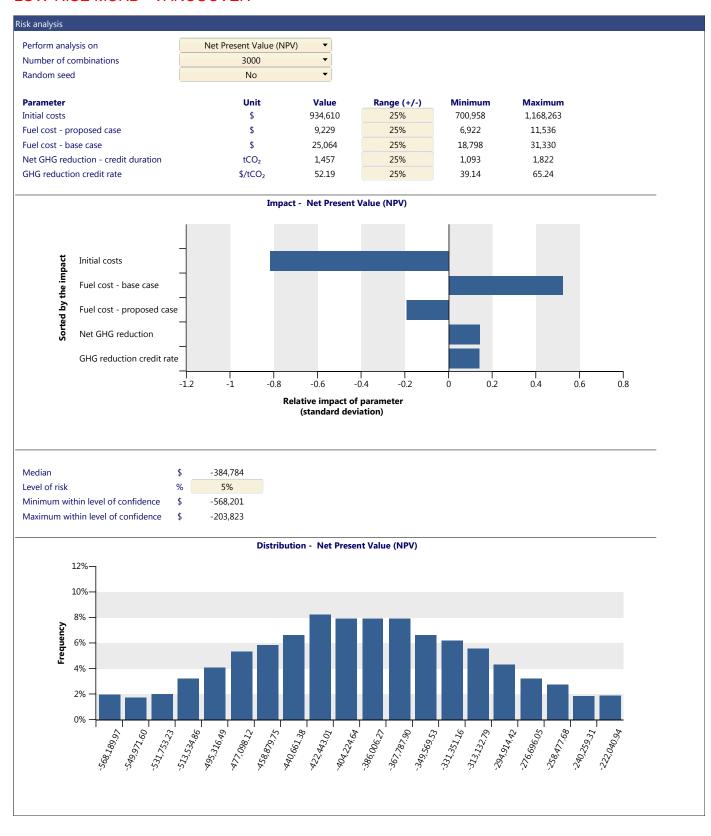
#### Risk analysis Perform analysis on Net Present Value (NPV) Number of combinations 3000 Random seed No Parameter Unit Value Range (+/-) Maximum 1,298,096 Initial costs 1,038,477 25% 778.858 Fuel cost - proposed case 15,713 25% 11,785 19,642 Fuel cost - base case 43,710 25% 32,783 54,638 Net GHG reduction - credit duration tCO<sub>2</sub> 2,008 25% 1,506 2,510 GHG reduction credit rate \$/tCO<sub>2</sub> 52.19 25% 39.14 65.24 Impact - Net Present Value (NPV) Fuel cost - base case Initial costs Fuel cost - proposed case Net GHG reduction GHG reduction credit rate -0.8 -0.6 -0.4 -0.2 0.2 0.4 0.6 0.8 Relative impact of parameter (standard deviation) -148,114 Median Level of risk 5% Minimum within level of confidence -392,780 Maximum within level of confidence \$ 103,325 **Distribution - Net Present Value (NPV)** 12%¬ 10%-Frequency 6% –

#### **LOW-RISE MURB - VANCOUVER**

**RETScreen - Sensitivity & Risk Analysis** 



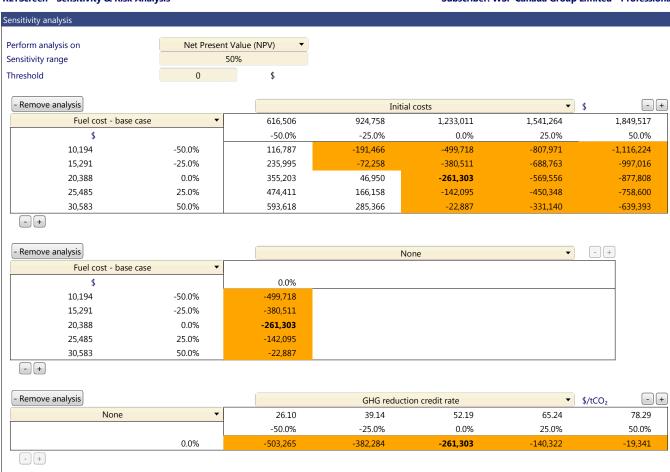
#### **LOW-RISE MURB - VANCOUVER**



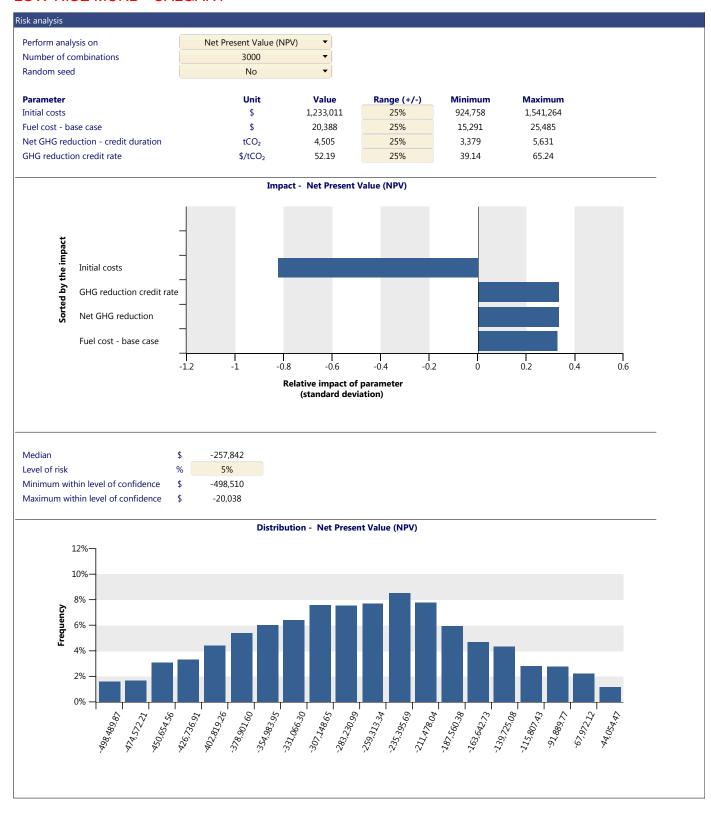
#### **LOW-RISE MURB - CALGARY**

#### **RETScreen - Sensitivity & Risk Analysis**

+ Add analysis

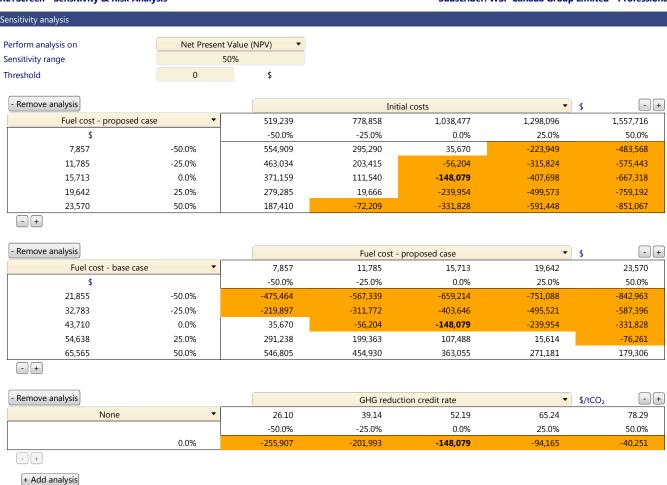


#### **LOW-RISE MURB - CALGARY**



#### **LOW-RISE MURB - TORONTO**

**RETScreen - Sensitivity & Risk Analysis** 



#### **LOW-RISE MURB - TORONTO**

Perform analysis on	Net Present Value (NPV)	•				
Number of combinations	3000	•				
Random seed	No	•				
Parameter	Unit	Value	Range (+/-)	Minimum	Maximum	
Initial costs	\$	1,038,477	25%	778,858	1,298,096	
Fuel cost - proposed case	\$	15,713	25%	11,785	19,642	
Fuel cost - base case	\$	43,710	25%	32,783	54,638	
Net GHG reduction - credit duration GHG reduction credit rate	tCO <sub>2</sub> \$/tCO <sub>2</sub>	2,008 52.19	25% 25%	1,506 39.14	2,510 65.24	
and reduction credit rate	\$/ tCO <sub>2</sub>	32.19	2376	33.14	03.24	
	Impact -	Net Present	Value (NPV)			
_						
Fuel cost - base case						
Initial costs						
#						
Fuel cost - base case  Initial costs  Fuel cost - proposed case  Net GHG reduction						
Net GHG reduction						
<b>6</b>						
GHG reduction credit rate						
† -1	-0.8 -0.6	-0.4 -	0.2 0	0.2 0.4	0.6	0.8 1
•		tive impact of		0.2	0.0	0.0
		(standard dev				
Median \$	-148.114					
	-148,114 5%					
Level of risk %						
Level of risk % Minimum within level of confidence \$	5%					
Level of risk % Minimum within level of confidence \$	5% -392,780 103,325					
Level of risk % Minimum within level of confidence \$	5% -392,780 103,325	n - Net Prese	nt Value (NPV)			
Level of risk % Minimum within level of confidence \$	5% -392,780 103,325	n - Net Prese	nt Value (NPV)			
Level of risk % Minimum within level of confidence \$ Maximum within level of confidence \$	5% -392,780 103,325	n - Net Prese	nt Value (NPV)			
Level of risk % Minimum within level of confidence \$ Maximum within level of confidence \$  12% 10%	5% -392,780 103,325	n - Net Prese	nt Value (NPV)			
Level of risk % Minimum within level of confidence \$ Maximum within level of confidence \$  12% 10% 8%	5% -392,780 103,325	n - Net Prese	nt Value (NPV)			
Level of risk % Minimum within level of confidence \$ Maximum within level of confidence \$  12% 10% 8%	5% -392,780 103,325	n - Net Prese	nt Value (NPV)			
Level of risk % Minimum within level of confidence \$ Maximum within level of confidence \$  12% 10% 8% 6%	5% -392,780 103,325	n - Net Prese	nt Value (NPV)			
Level of risk % Minimum within level of confidence \$ Maximum within level of confidence \$  12% 10% 8%	5% -392,780 103,325	n - Net Prese	nt Value (NPV)			
Level of risk % Minimum within level of confidence \$ Maximum within level of confidence \$  12% 10% 8% 4%	5% -392,780 103,325	n - Net Prese	nt Value (NPV)			
Level of risk % Minimum within level of confidence \$ Maximum within level of confidence \$  12% 10% 8% 6% 4% 2%	5% -392,780 103,325	n - Net Prese	nt Value (NPV)			
Level of risk % Minimum within level of confidence \$ Maximum within level of confidence \$  12% 10% 8% - 4% - 2% - 2%	5% -392,780 103,325 Distributio					
Level of risk % Minimum within level of confidence \$ Maximum within level of confidence \$  12% 10% 8% 4% 2%	5% -392,780 103,325 Distributio			23.8	2,300 2,300	P151
Level of risk % Minimum within level of confidence \$ Maximum within level of confidence \$  12% 10% 8% - 4% - 2%	5% -392,780 103,325 Distributio			0,305,54 \$5502,16	4200	28.23 <sub>24</sub>
Level of risk % Minimum within level of confidence \$ Maximum within level of confidence \$  12% 10% 8% 4% 2%	5% -392,780 103,325 Distributio			25.505.05-74 24.505.05-74 24.505.05-74	4204	17.68 18.88
Level of risk % Minimum within level of confidence \$ Maximum within level of confidence \$  12% 10% 8% 4% 2%	5% -392,780 103,325 Distributio			*5.50 <sub>2.16</sub>	406.85	17.58 17.68

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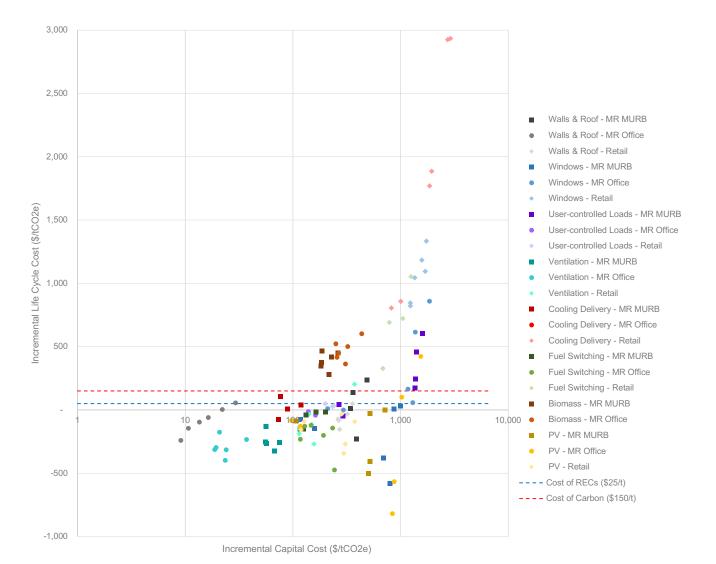


### **B-4** INDIVIDUAL BUNDLE SUMMARY RESULTS

The GHG abatement curve shown in the following Figure provides an overall summary of the life-cycle and capital costs per tonne of GHG emissions saved for each bundle of carbon abatement measures (based on independent contribution), across the mid-rise MURB, mid-rise office, and retail archetypes. The six results for each archetype/bundle combination reflect the six communities studied.

This graph highlights the relationship between incremental capital cost and life-cycle cost (on a logarithmic scale), as well as the overall trends across the scenarios investigated for this study. For example, improvements to walls and roofs in the mid-rise office archetype have the lowest incremental capital cost and almost always offer a positive life-cycle return (with the exception of one community), Improvements to cooling delivery in retail archetypes is both capital intensive and does not offer a life-cycle return, which is one of the key reasons that an alternate ZCB design was developed for this study. This design incorporated different carbon reduction measures and was used to assess whole-building life-cycle costs.

Some archetype and location combinations did not demonstrate emissions reduction with User-controlled Load measures alone, and are therefore not represented.



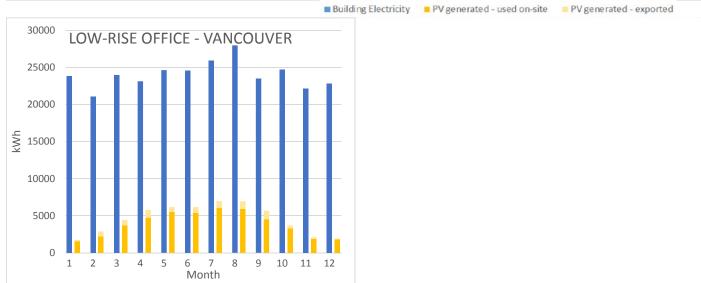
118 CaGBC | Making the Case for Building to Zero Carbon | Appendix

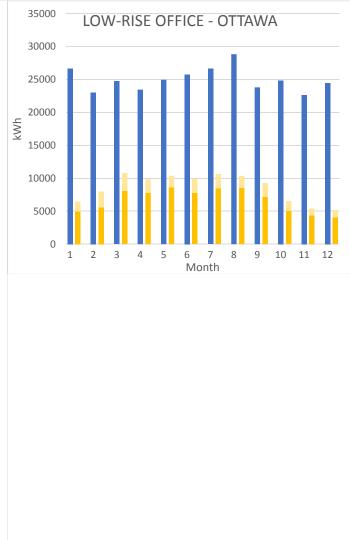


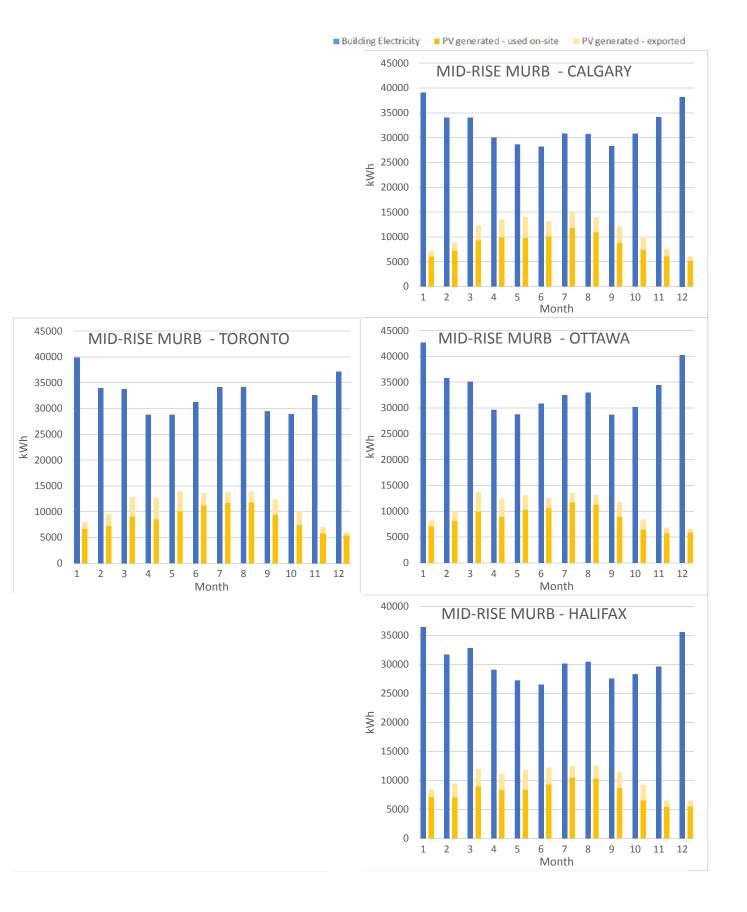
### **B-5** SELECTED HOURLY PV ANALYSIS RESULTS

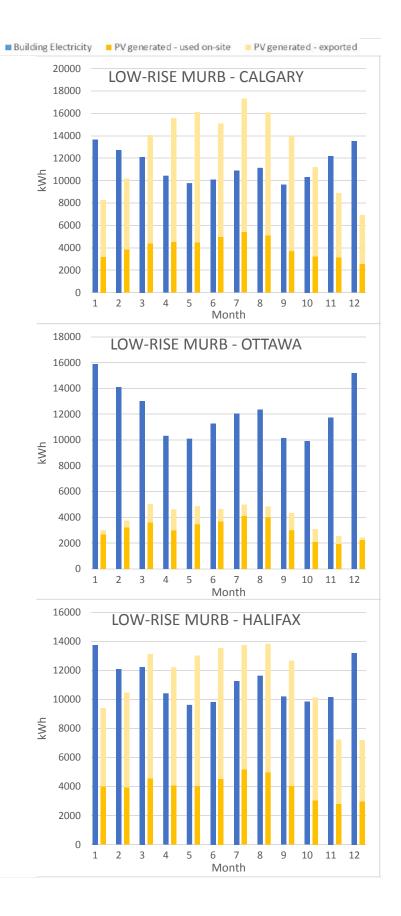
Beginning on page 119.



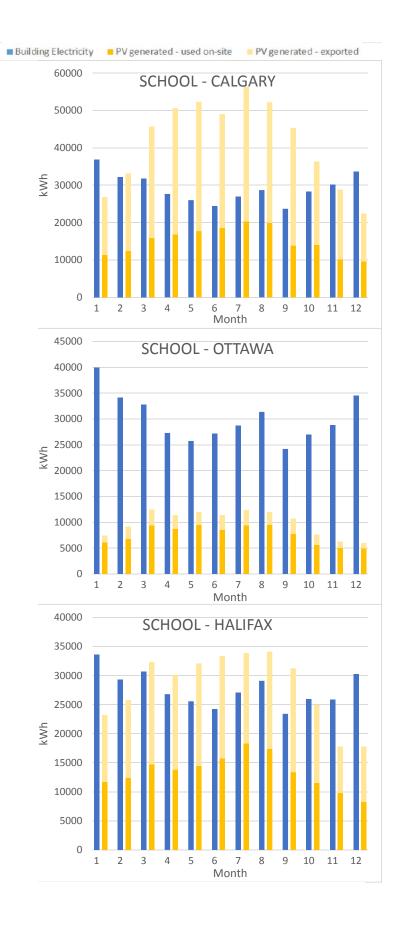






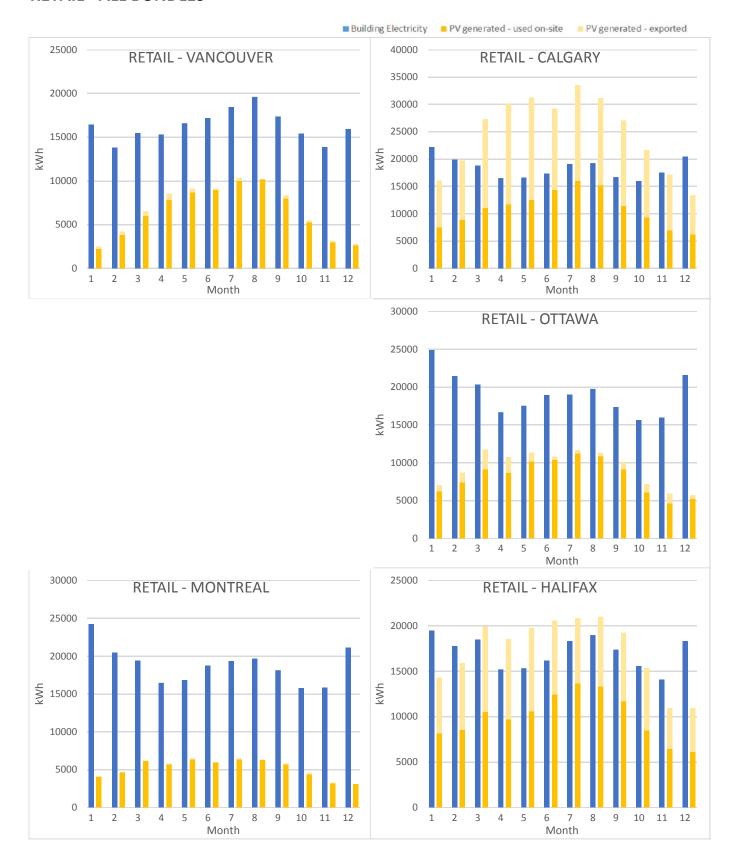




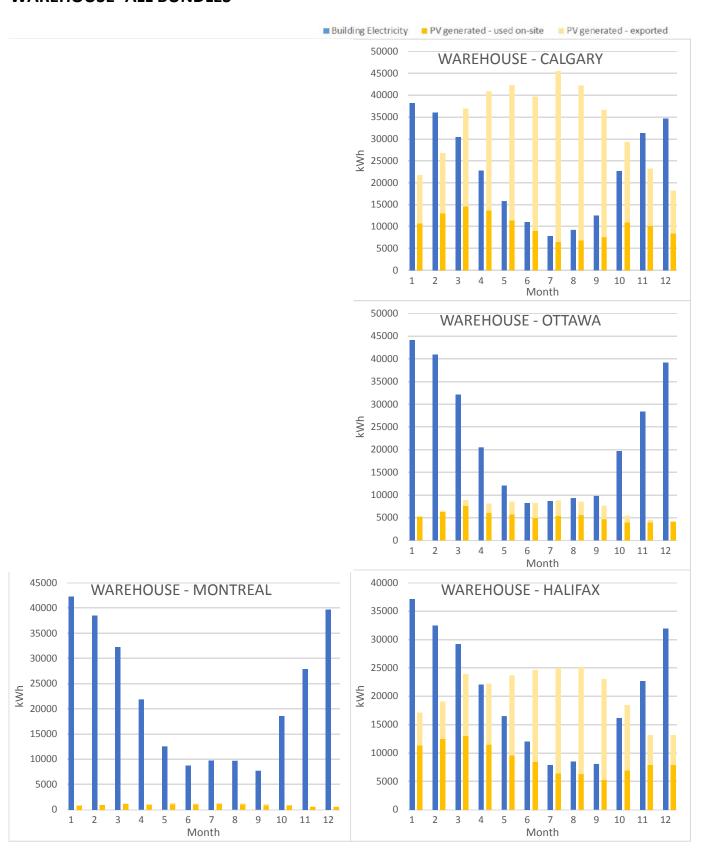




#### **RETAIL - ALL BUNDLES**



#### **WAREHOUSE- ALL BUNDLES**



## **APPENDIX C**

**ELEMENTAL COST BREAKDOWNS** 

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### C ELEMENTAL COST BREAKDOWNS

Terms used to refer to archetypes changed slightly throughout the study development process, leading to some inconsistency in the naming conversion used for the capital cost analysis and that used in the final report. The following table highlights the equivalency between terms used in the costing report to those of the final study report.

Costing Report	Final Study Report
Base	NECB-2011 Baseline
100% ECM Reduction	Zero Carbon Building (ZCB)
High-Rise (e.g. High-Rise MURB or High-Rise Office)	Mid-Rise
Stand Alone Retail	Big Box Retail

#### MULTIPLE ESTIMATE SUMMARY

CONSTRUCTION COSTS FOR GENERIC BUILDING TYPES ORDER OF MAGNITUDE ESTIMATE

DECEMBER 06, 2018



Hard Construction Costs	GFA (m2)	Unit (Cost/SF)	Unit (Cost/m2)	Estimated Total
Construction Costs Based on Toronto, ON				
1a Low Rise Office Building - Base	4,983	305	\$3,285.97	\$16,374,000
1b Low Rise Office Building - 100% ECM Reduction	4,983	316	\$3,398.35	\$16,934,000
2a Low Rise Multi Use Residential Building	3,135	305	\$3,287.08	\$10,305,000
2b Low Rise Multi Use Residential Building - 100% ECM Reduction	3,135	345	\$3,709.41	\$11,629,000
3a Stand Alone Retail Building - Base	2,294	228	\$2,456.84	\$5,636,000
3b Stand Alone Retail Building - 100% ECM Reduction	2,294	318	\$3,418.05	\$7,841,000
4a Primary School Building - Base	6,871	292	\$3,148.30	\$21,632,000
4b Primary School Building - 100% ECM Reduction	6,871	342	\$3,682.87	\$25,305,000
5a Warehouse Building - Base	4,835	176	\$1,892.66	\$9,151,000
5b Warehouse Building - 100% ECM Reduction	4,835	224	\$2,411.58	\$11,660,000
6a High Rise Multi Use Residential Building	9,396	303	\$3,264.47	\$30,673,000
6b High Rise Multi Use Residential Building - 100% ECM Reduction	9,396	329	\$3,540.02	\$33,262,000
7a High Rise Office Building - Base	49,896	236	\$2,541.37	\$126,804,000
7b High Rise Office Building - 100% ECM Reduction	49,896	242	\$2,605.32	\$129,995,000

Cost Comparison Per Location	Vancouver	Calgary	Toronto	Ottawa	Montreal	Halifax
1a Low Rise Office Building - Base	\$15,463,000	\$16,307,000	\$16,374,000	\$16,005,000	\$15,570,000	\$15,231,000
Cost per m2	\$3,103	\$3,273	\$3,286	\$3,212	\$3,125	\$3,057
1b Low Rise Office Building - 100% ECM Reduction	\$15,985,000	\$16,865,000	\$16,934,000	\$16,565,000	\$16,099,000	\$15,754,000
Cost per m2	\$3,208	\$3,385	\$3,398	\$3,324	\$3,231	\$3,162
2a Low Rise Multi Use Residential Building - Base	\$9,771,000	\$10,273,000	\$10,305,000	\$10,076,000	\$9,820,000	\$9,593,000
Cost per m2	\$3,117	\$3,277	\$3,287	\$3,214	\$3,132	\$3,060
2b Low Rise Multi Use Residential Building - 100% ECM Reduction	\$11,000,000	\$11,577,000	\$11,629,000	\$11,369,000	\$11,062,000	\$10,826,000
Cost per m2	\$3,509	\$3,693	\$3,709	\$3,626	\$3,529	\$3,453
3a Stand Alone Retail Building - Base	\$5,345,000	\$5,626,000	\$5,636,000	\$5,516,000	\$5,375,000	\$5,242,000
Cost per m2	\$2,330	\$2,452	\$2,457	\$2,405	\$2,343	\$2,285
3b Stand Alone Retail Building - 100% ECM Reduction	\$7,390,000	\$7,798,000	\$7,841,000	\$7,668,000	\$7,443,000	\$7,294,000
Cost per m2	\$3,221	\$3,399	\$3,418	\$3,343	\$3,245	\$3,180
4a Primary School Building - Base	\$20,461,000	\$21,589,000	\$21,632,000	\$21,155,000	\$20,593,000	\$20,102,000
Cost per m2	\$2,978	\$3,142	\$3,148	\$3,079	\$2,997	\$2,926
4b Primary School Building - 100% ECM Reduction	\$23,879,000	\$25,209,000	\$25,305,000	\$24,737,000	\$24,045,000	\$23,522,000
Cost per m2	\$3,475	\$3,669	\$3,683	\$3,600	\$3,499	\$3,423
5a Warehouse Building - Base	\$8,661,000	\$9,117,000	\$9,151,000	\$8,964,000	\$8,710,000	\$8,517,000
Cost per m2	\$1,791	\$1,886	\$1,893	\$1,854	\$1,801	\$1,762
5b Warehouse Building - 100% ECM Reduction	\$10,988,000	\$11,583,000	\$11,660,000	\$11,403,000	\$11,061,000	\$10,850,000
Cost per m2	\$2,273	\$2,396	\$2,412	\$2,358	\$2,288	\$2,244
6a High Rise Multi Use Residential Building - Base	\$29,092,000	\$30,644,000	\$30,673,000	\$29,988,000	\$29,252,000	\$28,502,000
Cost per m2	\$3,096	\$3,261	\$3,264	\$3,192	\$3,113	\$3,033
6b High Rise Multi Use Residential Building - 100% ECM Reduction	\$31,505,000	\$33,197,000	\$33,262,000	\$32,514,000	\$31,687,000	\$30,912,000
Cost per m2	\$3,353	\$3,533	\$3,540	\$3,460	\$3,372	\$3,290
7a High Rise Office Building - Base	\$119,531,000	\$126,190,000	\$126,804,000	\$124,001,000	\$120,407,000	\$117,990,000
Cost per m2	\$2,396	\$2,529	\$2,541	\$2,485	\$2,413	\$2,365
7b High Rise Office Building - 100% ECM Reduction	\$122,753,000	\$129,416,000	\$129,995,000	\$127,276,000	\$123,540,000	\$121,034,000
Cost per m2	\$2,460	\$2,594	\$2,605	\$2,551	\$2,476	\$2,426

#### **ELEMENTAL SUMMARY CARBON COSTING STUDY - LOW RISE** OFFICE BASE



CLASS D ESTIMATE (Rev.3)

	ASS D ESTIMATE (Rev.3)				Cress Flags	(	4 002
INC	VEMBER 22, 2018				Gross Floor	ost Per m2	4,983 3,103
					Location :		couver
				Elem	ental Cost		
	scription	Datia	Overtite	Heit	Unit	Sub	Element
	ment\Sub-Element	Ratio	Quantity	Unit	Rate	Element	Total
	SHELL						
A1.	Sub-Structure						\$519,277
	A1.1 Foundations	0.33	1,661	m2	\$312.63	\$519,277	
A2	Structure						\$2,767,409
	A2.1 Lowest Floor Construction	0.33	1,661	m2	\$86.25	\$143,265	
	A2.2 Upper Floor Construction	0.67	3,322	l I	\$614.20	\$2,040,386	
	A2.3 Roof Construction	0.33	1,661	m2	\$351.45	\$583,758	
A3.	Exterior Enclosure						\$1,926,631
	A3.2 Walls Above Grade	0.40	1,978	l I	\$781.11	\$1,545,042	
	A3.3 Windows & Entrances A3.4 Roof Finish	0.00		m2	\$3,087.83	\$55,581	
	A3.5 Projections	0.33 1.00	1,661 4,983	l I	\$175.55 \$6.91	\$291,581 \$34,428	
R	INTERIORS	1.00	1,000		ψ0.01	ψο 1, 120	
							2122 112
ВΊ	Partitions & Doors						\$109,443
	B1.1 Partitions B1.2 Doors	0.01		m2	\$382.00	\$22,920	
		0.02	76	m2	\$1,138.46	\$86,523	*=**
BZ	Finishes						\$763,412
	B2.1 Floor Finishes	0.95	4,734	l I	\$65.70	\$311,005	
	B2.2 Ceiling Finishes B2.3 Wall Finishes	0.95 1.80	4,734 8,969	l I	\$76.11 \$10.27	\$360,319 \$92,088	
ВЗ	Fittings & Equipment	1.00	0,505	1112	Ψ10.27	Ψ32,000	\$0.40.222
БЗ		4.00	4 000		***	<b>4.70 700</b>	\$848,233
	B3.1 Fittings & Fixtures B3.3 Conveying Systems	1.00 1.00	4,983 4,983	l I	\$36.07 \$134.16	\$179,733 \$668,500	
_	SERVICES	1.00	4,900	1112	ψ104.10	ψ000,300	
							** === * * *
C1	Mechanical						\$2,707,012
	C1.1 Plumbing & Drainage C1.2 Fire Protection	1.00	4,983	l I	\$80.12	\$399,233	
	C1.3 Heating, Ventilation, Air Cond.	1.00 1.00	4,983 4,983		\$27.94 \$384.06	\$139,223 \$1,913,772	
	C1.4 Controls	1.00	4,983		\$51.13	\$254,784	
C2	Electrical						\$1,251,286
	C2.1 Service & Distribution	1.00	4,983	m2	\$79.28	\$395,049	
	C2.2 Lighting, Devices & Heating	1.00	4,983		\$124.41	\$619,924	
	C2.3 Systems & Ancillaries	1.00	4,983	m2	\$47.42	\$236,313	
D.	SITE & ANCILLARY WORK						
D1	Site Work						\$270,367
	D1.3 Electrical Site Services	1.00	4,983	m2	\$54.26	\$270,367	
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$1,122,698
	Z1.1 General Requirements	1.00	4,983	m2	\$152.48	\$759,798	
	Z1.2 Fees	1.00	4,983		\$72.83	\$362,900	
<b>Z</b> 2	Allowances						\$3,177,190
	Z2.1 Design Allowance	1.00	4,983	m2	\$488.17	\$2,432,576	
	Z2.2 Escalation Allowance	1.00	4,983		Excluded	, . 52,5. 0	
	Z2.3 Construction Allowance	1.00	4,983	m2	\$149.43	\$744,614	
	Total				\$288	per sf	\$15,463,000
					<b>Ψ</b> 230	P 5. 5.	φ.1-0 <sub>1</sub> .1-00 <sub>1</sub> 000

A.W. HOOKER ASSOCIATES LTD. PROJECT NO:116065 PAGE C1 A.W. HOOKER ASSOCIATES LTD. PROJECT NO:118065 PAGE MS1

## ELEMENTAL SUMMARY CARBON COSTING STUDY - LOW RISE OFFICE BASE



CLASS D ESTIMATE (Rev.3) NOVEMBER 22, 2018

Gross Floor Area (m2) 4,983 Cost Per m2 3,273

					С	ost Per m2	3,273
					Location:	C	algary
				Elem	ental Cost		
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A.	SHELL						
Α1	. Sub-Structure						\$569,739
	A1.1 Foundations	0.33	1,661	m2	\$343.01	\$569,739	
Δ2	Structure		1,221			4555,: 55	\$2,886,219
	A2.1 Lowest Floor Construction	0.33	1,661	m2	\$89.96	\$149,415	<del>\$2,000,210</del>
	A2.2 Upper Floor Construction	0.33	· ·	1 1	\$640.57		
	A2.3 Roof Construction	0.33	1,661		\$366.54	\$608,820	
А3	. Exterior Enclosure						\$2,009,345
	A3.2 Walls Above Grade	0.40	1,978	m2	\$814.65	\$1,611,374	
	A3.3 Windows & Entrances	0.00	18	m2	\$3,220.40		
	A3.4 Roof Finish	0.33	1,661	m2	\$183.08	\$304,099	
	A3.5 Projections	1.00	4,983	m2	\$7.21	\$35,906	
В.	INTERIORS						
В1	Partitions & Doors						\$114,142
	B1.1 Partitions	0.01	60	m2	\$398.40	\$23,904	
	B1.2 Doors	0.02	76	m2	\$1,187.34	\$90,238	
B2	Finishes						\$813,241
	B2.1 Floor Finishes	0.95	4,734	m2	\$64.35	\$304,652	
	B2.2 Ceiling Finishes	0.95	4,734	1 1	\$84.71	\$401,037	
	B2.3 Wall Finishes	1.80	8,969	m2	\$11.99	\$107,552	
В3	Fittings & Equipment						\$884,649
	B3.1 Fittings & Fixtures	1.00	,	1 1	\$37.62		
	B3.3 Conveying Systems	1.00	4,983	m2	\$139.92	\$697,200	
C.	SERVICES						
C1	Mechanical						\$2,893,804
	C1.1 Plumbing & Drainage	1.00		1 1	\$85.65		
	C1.2 Fire Protection	1.00	4,983	1 1	\$29.87		
	C1.3 Heating, Ventilation, Air Cond. C1.4 Controls	1.00 1.00	4,983 4,983	1 1	\$410.56 \$54.66	\$2,045,828 \$272,365	
C2	Electrical	1.00	1,000		ψο 1.00	Ψ212,000	\$1,369,463
02	C2.1 Service & Distribution	4.00	4.000	0	¢00.77	£400.050	\$1,369,463
	C2.1 Service & Distribution  C2.2 Lighting, Devices & Heating	1.00 1.00	4,983 4,983	1 1	\$86.77 \$136.16	\$432,359 \$678,472	
	C2.3 Systems & Ancillaries	1.00	,	1 1	\$51.90		
D.	SITE & ANCILLARY WORK						
D1	Site Work						\$281,975
	D1.3 Electrical Site Services	1.00	4,983	m2	\$56.59	\$281,975	
7	GENERAL REQUIREMENTS	1.00	1,000		φου.σο	Ψ201,010	
	& ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$1,170,898
	Z1.1 General Requirements	1.00	4,983	m2	\$159.02	\$792,418	
	Z1.2 Fees	1.00			\$75.95		
<b>Z</b> 2	Allowances						\$3,313,592
	Z2.1 Design Allowance	1.00	4,983	m2	\$509.13	\$2,537,011	
l	Z2.2 Escalation Allowance	1.00		1 1	Excluded		
	Z2.3 Construction Allowance	1.00	4,983	m2	\$155.85	\$776,581	
	Total				\$304	per sf	\$16,307,000
					<b>400</b> 4	P 0. 0.	<del>-</del>

## ELEMENTAL SUMMARY CARBON COSTING STUDY - LOW RISE OFFICE BASE



CLASS D ESTIMATE (Rev.3)

	ASS DESTIMATE (Rev.3) VEMBER 22, 2018				Gross Floor	Area (m2)	4,983	
					С	3,286		
					Location :	To	oronto	
D	- white the co			Elem	ental Cost	Out	El	
	cription nent\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total	
	SHELL							
A1.	Sub-Structure						\$542,609	
	A1.1 Foundations	0.33	1,661	m2	\$326.68	\$542,609		
A2.	Structure						\$2,897,811	
	A2.1 Lowest Floor Construction	0.33	1,661	m2	\$90.32	\$150,016		
	A2.2 Upper Floor Construction	0.67	3,322	m2	\$643.15	\$2,136,530		
	A2.3 Roof Construction	0.33	1,661	m2	\$368.01	\$611,265		
A3.	Exterior Enclosure						\$2,017,415	
	A3.2 Walls Above Grade	0.40	1,978	m2	\$817.92	\$1,617,845		
	A3.3 Windows & Entrances	0.00	18	m2	\$3,233.33	\$58,200		
	A3.4 Roof Finish	0.33	1,661		\$183.82	\$305,320		
	A3.5 Projections	1.00	4,983	m2	\$7.23	\$36,050		
В.	INTERIORS							
В1	Partitions & Doors						\$114,600	
	B1.1 Partitions	0.01	60	m2	\$400.00	\$24,000		
	B1.2 Doors	0.02	76	m2	\$1,192.11	\$90,600		
В2	Finishes						\$772,67	
	B2.1 Floor Finishes	0.95	4,734	m2	\$61.00	\$288,770	, ,,	
	B2.2 Ceiling Finishes	0.95	4,734		\$81.14	\$384,135		
	B2.3 Wall Finishes	1.80	8,969		\$11.12	\$99,770		
В3	Fittings & Equipment						\$888,20	
	B3.1 Fittings & Fixtures	1.00	4,983	m2	\$37.77	\$188,202	<del></del>	
	B3.3 Conveying Systems	1.00	4,983		\$140.48	\$700,000		
C	SERVICES	1.00	1,000		ψ110.10	ψ1 00,000		
							*****	
61	Mechanical						\$2,964,963	
	C1.1 Plumbing & Drainage	1.00	4,983		\$87.75	\$437,276		
	C1.2 Fire Protection C1.3 Heating, Ventilation, Air Cond.	1.00	4,983		\$30.60	\$152,490		
	C1.4 Controls	1.00 1.00	4,983 4,983		\$420.66 \$56.00	\$2,096,135 \$279,063		
^^		1.00	4,500	1112	ψ00.00	Ψ213,000	24 222 244	
<b>6</b> 2	Electrical						\$1,390,318	
	C2.1 Service & Distribution	1.00	4,983		\$88.09	\$438,943		
	C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries	1.00 1.00	4,983 4,983		\$138.23 \$52.69	\$688,804 \$262,570		
_	SITE & ANCILLARY WORK	1.00	4,903	1112	φ32.09	φ202,370		
ט1	Site Work						\$283,107	
	D1.3 Electrical Site Services	1.00	4,983	m2	\$56.81	\$283,107		
Z.	GENERAL REQUIREMENTS & ALLOWANCES							
<b>Z</b> 1	General Requirements & Fees						\$1,175,600	
	Z1.1 General Requirements	1.00	4,983	m2	\$159.66	\$795,600		
	Z1.2 Fees	1.00	4,983		\$76.26	\$380,000		
Z2	Allowances						\$3,326,90	
	Z2.1 Design Allowance	1.00	4,983	<sub>m2</sub>	\$511.18	\$2,547,200	,	
	Z2.2 Escalation Allowance	1.00	4,983		Excluded	ψ∠,υ+1,∠00		
	Z2.3 Construction Allowance	1.00	4,983		\$156.47	\$779,700		
	Tatal			i I	***		¢40.0=+-0=	
	Total	1			\$305	per sf	\$16,374,000	

A.W. HOOKER ASSOCIATES LTD. PROJECT NO:116065 PAGE C1 A.W. HOOKER ASSOCIATES LTD. PROJECT NO:116065 PAGE C1

#### **ELEMENTAL SUMMARY CARBON COSTING STUDY - LOW RISE**



CLASS D ESTIMATE (Rev.3) NOVEMBER 22, 2018

**OFFICE BASE** 

Gross Floor Area (m2) 4,983

A2. Structure  A2. Lowest Floor Construction A2. 2 Upper Floor Construction A3. 2 Walls Above Grade A3. Exterior Enclosure A3. Walls Above Grade A3. 3 Windows & Entrances A3. 3 Windows & Entrances A3. 3 Windows & Entrances A3. 4 Roof Finish Done B1. Partitions B1. Partitions B2. 1 Floor Finishes B2. 1 Floor Finishes B2. 1 Floor Finishes B2. 2 Celling Finishes B2. 3 Wall Finishes B3. 3 Conveying Systems B3. 3 Conveying Systems B3. 3 Conveying Systems B3. 3 Conveying Systems C1. 2 Floor Finishes C1. 1 Flumbing & Drainage C1. 2 Floor Finishes C1. 2 Lighting, Verification C1. 3 Heating, Verification C2. 2 Lighting, Devices & Heating C2. 3 Systems & Ancillators C3. 3 Systems & Ancillators C3. 3 Systems & Ancillators C4. 4983 m2 C5. 56. 47 C5. 56. 57. 79. 688. 11. 58. 57. 56. 57. 57. 56. 57. 57. 57. 57. 57. 57. 57. 57. 57. 57						С	ost Per m2	3,212
Description   Submitted   Country   Unit   Ratio   Element   Total						Location :	0	ttawa
A. SHELL					Elem			
A1. Sub-Structure  A1.1 Foundations  A2. Structure  A2.1 Lowest Floor Construction A2.2 Upper Floor Construction A2.2 Upper Floor Construction A3.2 Exterior Enclosure  A3. Exterior Enclosure  A3.2 Walls Above Grade A3.3 Windows & Entrances A3.4 Roof Finish A3.5 Projections B1 Partitions & Doors B1.1 Partitions B1.1 Partitions B2.1 Floor Finishes B2.1 Floor Finishes B2.1 Floor Finishes B2.2 Celling Finishes B2.3 Conveying Systems B3.3 Conveying Systems C3.3 Wall Finishes B3.3 Conveying Systems C1.1 Flumbing & Drainage C1.1 Flumbing & Drainage C1.1 Flumbing & Drainage C1.1 Flumbing & Drainage C1.2 Fire Protection C1.3 Heating, Ventilation, Air Cond. C1.4 Controls C2.2 Lighting, Devices & Heating C2.2 Systems & Ancillaries D. Strucks C3.4 General Requirements C3.4 General Requirements C3.4 General Requirements C4.4 B83 m2 C5.4 Span C5.5 See Span C5.5 See Span C5.5 See Span C6.5 See Span C6.5 Span C7.7 Span C7.4 Span			Ratio	Quantity	Unit			
A2. Structure  A2. Lowest Floor Construction A2. Structure  A2. Lowest Floor Construction A2. 2 Upper Floor Construction A2. 2 Upper Floor Construction A3. 3 1,661 m2 \$88.51 \$147,015 A2. 2 Upper Floor Construction A3. 3 1,661 m2 \$88.51 \$147,015 A2. 3 Roof Construction A3. 3 1,661 m2 \$88.51 \$147,015 A2. 3 Roof Construction A3. 2 Walls Above Grade A3. 3 Walls Above Grade A3. 3 Wholewas & Entrances A3. 4 Roof Finish A3.5 Projections B. INTERIORS B. INTERIORS B. INTERIORS B. Partitions & Doors B.1.1 Partitions B.1.2 Doors B.1.2 Doors B.2.2 Ceiling Finishes B.2.2 Ceiling Finishes B.2.2 Ceiling Finishes B.3.1 Fittings & Equipment B.3.1 Fittings & Equipment B.3.1 Fittings & Equipment B.3.1 Fittings & Fixtures B.3.3 Conveying Systems B.1.00 A,983 m2 B.3.4 Sep. 5 Sep.	A.	SHELL						
A2. Structure  A2.1 Lowest Floor Construction A2.2 Upper Floor Construction A2.2 Upper Floor Construction A2.3 Roof Construction A2.3 Roof Construction A3. Exterior Enclosure A3.2 Walls Above Grade A3.3 Widnows & Entrances A3.4 Roof Finish A3.5 Projections B1.1 Partitions & Doors B1.1 Partitions & Doors B1.1 Partitions & Doors B1.1 Partitions B2.1 Floor Finishes B2.2 Ceiling Finishes B2.2 Ceiling Finishes B2.2 Ceiling Finishes B3.1 Fittings & Equipment C1.1 Plumbing & Drainage C1.2 Fire Protection C1.3 Heading, Ventilation, Air Cond. C1.4 Controls C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries D. SITE & ANCILLARY WORK D1 Site Work C1 General Requirements Z1.1 Coners Z1.1 Ceneral Requirements Z1.2 Less Standard Z1.2 Less Standard Z2.3 Construction Allowance Z2.2 Less Standard Z3.8	A1	. Sub-Structure						\$527,959
A2.1 Lowest Floor Construction A2.2 Upper Floor Construction A2.3 Roof Construction A2.3 Roof Construction A3. Exterior Enclosure  A3.4 Walls Above Grade A3.3 Windows & Entrances A3.4 Roof Flinish A3.5 Projections B1.1 Partitions B1.1 Partitions B1.1 Partitions B1.2 Poors B1.1 Flitings & Equipment B3.2 Celling Finishes B2.3 Wall Finishes B2.3 Wall Finishes B2.3 Wall Finishes B2.1 Flitings & Equipment B3.1 Fittings & Equipment B3.1 Fittings & Equipment B3.1 Fittings & Fixtures B3.3 Conveying Systems C. SERVICES C1 Mechanical C1.1 Plumbing & Drainage C1.2 Fire Protection C1.3 Heating, Ventilation, Air Cond. C1.4 Controls C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries D. SITE & ANCILLARY WORK D1.3 Electrical Site Services Z1.1 General Requirements Z1.2 Fees  L1.00 4.983 m2 S153. Available Services S2.1 Dosign Allowance Z2.1 Dosign Allowance Z2.1 Dosign Allowance Z2.2 Ecaciation Allowance Z2.1 Dosign Allowance Z2.3 Construction Allowance Z2.4 Construction Allowance Z2.4 Construction Allowance Z2.5 Construction Allowance Z2.5 Construction Allowance Z2.5 Construction Allowance Z2.6 Construction Allowance Z2.7 Construction Allowance Z2.7 Construction Allowance Z2.8 Construction All		A1.1 Foundations	0.33	1,661	m2	\$317.86	\$527,959	
A2 2 Upper Floor Construction A2 3 Roof Construction A3 Setterior Enclosure A3 Exterior Enclosure A3 2 Walls Above Grade A3 3 Windows & Entrances A3 4 Roof Finish A3 5 Projections B1 Partitions B1 P	A2	. Structure						\$2,839,854
A2.2 Upper Floor Construction		A2.1 Lowest Floor Construction	0.33	1,661	m2	\$88.51	\$147,015	
A3. Exterior Enclosure  A3.2 Walls Above Grade A3.3 Windows & Entrances A3.4 Roof Flinish A3.5 Projections B1.00 B1.1 Partitions B1.2 Doors B1.1 Partitions B1.2 Doors B2.2 Hinishes B2.1 Floor Finishes B2.2 Ceiling Finishes B2.2 Ceiling Finishes B3.3 Fittings & Equipment B3.1 Fittings & Equipment B3.1 Fittings & Equipment B3.1 Fittings & Fixtures B3.3 Conveying Systems C. SERVICES C1 Mechanical C1.1 Plumbing & Drainage C1.2 Fire Protection C1.3 Heating, Ventilation, Air Cond. C1.3 Heating, Ventilation, Air Cond. C1.4 Controls C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries D. SITE & ANCILLARY WORK D1.3 Electrical Site Services C1.1 General Requirements E1.100 E1.20 Site Mork D1.3 Electrical Site Services C2.1 Losign Allowance C2.2 Losign Allowance C3.3 Construction Allowance C3.4 Construction Allowance C4.4 Sessiant Calcular C		A2.2 Upper Floor Construction	0.67	3,322	m2	\$630.28	\$2,093,799	
A3.2 Walls Above Grade A3.3 Windows & Entrances A3.4 Roof Finish A3.5 Projections A3.4 Roof Finish A3.5 Projections A3.5 Projections B1.00 A3.6 Projections B1.1 Partitions & Doors B1.1 Partitions B2.1 Floor Finishes B2.1 Floor Finishes B2.2 Ceiling Finishes B2.2 Ceiling Finishes B3.3 Conveying Systems B3.1 Fittings & Equipment C3.5 EVICES C1 Mechanical C1.1 Plumbing & Drainage C1.2 Fire Protection C1.3 Heating, Venilation, Air Cond. C1.4 Controls C2.1 Service & Distribution C2.2 Lighting, Devices & Heating C2.3 Systems & AncilLary WORK D1.5 Electrical Site Services Z1.1 General Requirements E2.1 Losign Allowance Z2.1 Design Allowance Z2.2 Escalation Allowance Z2.2 Escalation Allowance Z2.2 Escalation Allowance Z2.3 Construction Allowance Losign Agency Losign Agency Losign Agency S31,586, 48		A2.3 Roof Construction	0.33	1,661	m2	\$360.65	\$599,040	
A3.3 Windows & Entrances	А3	. Exterior Enclosure						\$1,977,067
A3.4 Roof Finish A3.5 Projections 1.00 4.983 m2 57.09 835,329 8. INTERIORS B1 Partitions & Doors B1.1 Partitions B1.2 Doors B1.1 Partitions B2.1 Floor Finishes B2.1 Floor Finishes B2.2 Ceiling Finishes B2.3 Wall Finishes B3.3 Surgh Finishes B3.3 Surgh Finishes B3.1 Fittings & Equipment B3.1 Fittings & Equipment B3.1 Fittings & Equipment B3.1 Fittings & Fixtures B3.3 Conveying Systems C1.2 Fine Protection C1.3 Heating, Ventilation, Air Cond. C1.4 Controls C1.2 Service & Distribution C2.2 Lighting, Devices & Heating C2.1 Service & Distribution C2.2 Systems & 1.00 C3.3 Systems & 1.00 C3.3 Systems & Ancillaries D. SITE & ANCILLARY WORK D1.3 Electrical Site Services Z1.1 General Requirements Z1.1 General Requirements Z1.1 General Requirements Z1.1 Design Allowance Z2.2 Escalation Allowance Z2.2 Escalation Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.3 Systems & 1.00 Z3.3 Construction Allowance Z3.3 Construction Allowance Z2.3 Systems & 1.00 Z3.3 Construction Allowance Z3.3 Construction Allowance Z2.1 Escalation Allowance Z2.3 Construction Allowance Z3.3 Construction Allowance Z3.5 Construction Allowance Z3.5 Construction Allowance Z3.5 Construction Allowance Z3.6 Construction Allowance Z3.6 Construction Allowance Z3.7 Construction Allowance		A3.2 Walls Above Grade	0.40	1,978	m2	\$801.56	\$1,585,488	
A3.5 Projections								
B. INTERIORS   B1 Partitions & Doors   S1.1 Partitions & Doors   S1.2 Poors   D.0.01   G0   m2   S392.00   S23,520   S112,520   S1.2 Poors   D.0.02   76   m2   S1,168.26   S88,788   S82.5   Poors   D.0.02   T6   m2   S1,168.26   S88,788   S1.5				· ·	l			
B1 Partitions & Doors   B1.1 Partitions   B1.2 Doors   B1.1 Partitions   B1.2 Doors   B1.2 Doors   B1.5 Doo	R	•	1.00	4,303	1112	Ψ1.09	Ψ55,529	
B1.1 Partitions								£442.200
B1.2 Doors  B2 Finishes  B2.1 Floor Finishes B2.2 Celling Finishes B2.3 Wall Finishes B3.3 Wall Finishes B3.4 Fittings & Equipment B3.1 Fittings & Fixtures B3.3 Conveying Systems B3.3	le,		2.24	22		****	400 500	\$112,308
B2 Finishes					l			
B2.1 Floor Finishes B2.2 Ceiling Finishes B2.2 Ceiling Finishes B2.3 Wall Finishes B2.3 Wall Finishes B3.3 Fittings & Equipment B3.1 Fittings & Fixtures B3.3 Conveying Systems B3.4 Selectrical B3.4 Selectrical B3.5 Selectrical B3.5 Selectrical B4.8 Selectrical B5.5 Selectrical B5.5 Selectrical B6.5 Selectrical B7.5 Selectrical Site Services B7.5 Selectrical Site Services B7.5 Selectrical Selectrical Site Services B7.5 Selectrical Selectrical Site Services B7.5 Selectrical Selectrical Selectrical Site Services B7.5 Selectrical	B2		0.02	70	1112	ψ1,100.20	φοσ,τοσ	\$731 404
B2.2 Ceiling Finishes B2.3 Wall Finishes B2.3 Wall Finishes B2.3 Wall Finishes B2.3 Wall Finishes B2.4 Requipment B3.1 Fittings & Equipment B3.1 Fittings & Fixtures B3.3 Conveying Systems B3.3 Conveying Systems B3.3 Conveying Systems B3.4 Fixtures B3.5 Fixtures B3.5 Fixtures B3.6 Fixtures B3.6 Fixtures B3.6 Fixtures B3.7 Fixtures B3.4 Fixtures B3.7 F	_		0.05	4 724	O	<b>#E0.0E</b>	<b>075 775</b>	\$731,404
B2.3 Wall Finishes  B3 Fittings & Equipment  B3.1 Fittings & Fixtures  B3.3 Conveying Systems  C. SERVICES  C1 Mechanical  C1.1 Plumbing & Drainage  C1.2 Fire Protection  C1.3 Heating, Ventilation, Air Cond.  C1.4 Controls  C2 Electrical  C2.1 Service & Distribution  C2.2 Lighting, Devices & Heating  C2.3 Systems & Ancillaries  D. SITE & ANCILLARY WORK  D1.3 Electrical Site Services  Z1.1 General Requirements & Fees  Z1.1 General Requirements & Fees  Z1.1 General Requirements & Fees  Z2.1 Design Allowance  Z2.2 Lescalation Allowance  Z2.2 Escalation Allowance  Z2.3 Construction Allowance  Z2.4 Escalation Allowance  Z2.3 Construction Allowance  Z2.4 Construction Allowance  Z2.6 Construction Allowance  Z2.6 Construction Allowance  Z2.7 Construction Allowance  Z3.8 Construction Allowance  Z4.983 m2  S10.71  S96.079  \$870.4  \$887.0  \$377.0  \$184.438  \$377.0  \$184.438  \$372.0  \$4.983 m2  \$4.88.6  \$4.22,845  \$4.22,845  \$4.22,845  \$4.22,845  \$4.22,845  \$4.22,845  \$4.22,845  \$4.22,845  \$4.22,845  \$4.22,845  \$4.22,845  \$4.22,845  \$4.22,845  \$4.22,845  \$4.22,845  \$4.22,845  \$4.20,626,636  \$4.983 m2  \$4.4983 m2  \$4.				-				
B3.1 Fittings & Fixtures   B3.3 Conveying Systems   1.00   4,983   m2   \$137.67   \$686,000		B2.3 Wall Finishes						
B3.3 Conveying Systems	ВЗ	Fittings & Equipment						\$870,438
C. SERVICES C1 Mechanical C1.1 Plumbing & Drainage C1.2 Fire Protection C1.3 Heating, Ventilation, Air Cond. C1.4 Controls C2.4 Controls C2.1 Service & Distribution C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries C3.5 Systems & Ancillaries C3.5 Systems & Ancillaries C4.5 General Requirements & Fees C5.5 General Requirements & Fees C5.6 General Requirements & Fees C5.6 Allowances C5.7 Allowances C5.7 Allowances C6.8 Services C6.9 Statistics C6.9 Statistics C6.1 Site Work C7.2 Lighting, Devices & Heating C7.3 Systems & Ancillaries C7.4 Systems & Ancillaries C7.5 Systems & Ancillaries C7.6 Systems & Ancillaries C7.6 Systems & Ancillaries C7.7 Systems & Ancillaries C7.8 Systems & Ancillaries C7.9 Systems & Systems & Systems C7.9 Systems C7.		B3.1 Fittings & Fixtures	1.00	4,983	m2	\$37.01	\$184,438	
C1 Mechanical  C1.1 Plumbing & Drainage C1.2 Fire Protection C1.3 Heating, Ventilation, Air Cond. C1.4 Controls  C2.1 Service & Distribution C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries  D. SITE & ANCILLARY WORK D1 Site Work D1.3 Electrical Site Services Z1.1 General Requirements & Fees Z1.1 General Requirements & Fees Z1.2 Fees  Z1.1 Design Allowance Z2.2 Hosign Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.4 Service & Distribution A 4,983 m2 A 52,959 S44.86 S422,845 S42,845 S422,845 S422,845 S422,845 S422,845 S422,845 S42,946 S422,845 S42,946 S4,948 M2 S43,544 S43,844 S43,844 S44,843 S44,843 S44,843 S44,843 S44,843 S44,843 S4		B3.3 Conveying Systems	1.00			\$137.67		
C1.1 Plumbing & Drainage	C.	SERVICES						
C1.2 Fire Protection       1.00       4,983       m2       \$29.59       \$147,458         C1.3 Heating, Ventilation, Air Cond.       1.00       4,983       m2       \$406.78       \$2,026,963         C1.4 Controls       1.00       4,983       m2       \$54.15       \$269,853         C2 Electrical       \$1,00       4,983       m2       \$88.00       \$438,504         C2.1 Service & Distribution       1.00       4,983       m2       \$138.09       \$688,115         C2.3 Systems & Ancillaries       1.00       4,983       m2       \$52.64       \$262,308         D. SITE & ANCILLARY WORK       1.00       4,983       m2       \$55.68       \$277,445         Z. GENERAL REQUIREMENTS & ALLOWANCES       1.00       4,983       m2       \$156.47       \$779,688         Z1.1 General Requirements & Fees       1.00       4,983       m2       \$156.47       \$779,688         Z1.2 Fees       1.00       4,983       m2       \$74.73       \$372,400         Z2 Allowances       2.1 Design Allowance       1.00       4,983       m2       \$500.95       \$2,496,256         Z2.2 Escalation Allowance       1.00       4,983       m2       \$153.34       \$764,106	C1	Mechanical						\$2,867,120
C1.3 Heating, Ventilation, Air Cond. C1.4 Controls  C2.4 Controls  C2.5 Electrical  C2.1 Service & Distribution C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries  C2.3 Systems & Ancillaries  C3.4 Service & Distribution C4.983 m2  C5.3 Systems & Ancillaries  C5.4 Service & Distribution C5.3 Systems & Ancillaries  C6.4 Services  C7.5 Service & Distribution C7.6 Site Work C7.6 Site Work C7.7 General Requirements C7.8 Services  C8.8 Services  C9.8 Services  C9.9 Services  C9.8 Services  C9.		C1.1 Plumbing & Drainage	1.00	4,983	m2	\$84.86	\$422,845	
C1.4 Controls		C1.2 Fire Protection	1.00	4,983	m2	\$29.59	\$147,458	
C2 Electrical  C2.1 Service & Distribution C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries  D. SITE & ANCILLARY WORK  D1 Site Work D1.3 Electrical Site Services  Z1.1 General Requirements Z1.2 Fees  T1.00  T2.1 Design Allowance Z2.2 Escalation Allowance Z2.3 Construction Allowance T1.00  T1		•						
C2.1 Service & Distribution C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries  D. SITE & ANCILLARY WORK D1 Site Work D1.3 Electrical Site Services  Z1 General Requirements & Fees Z1.1 General Requirements Z1.2 Fees  Z2.1 Design Allowance Z2.2 Escalation Allowance Z2.3 Construction Allowance Z3.4 Construction Allowance Z3.5 Systems & Heating 1.00 4.983 m2 4.983			1.00	4,983	m2	\$54.15	\$269,853	
C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries  D. SITE & ANCILLARY WORK  D1 Site Work D1.3 Electrical Site Services  Z1 General Requirements & Fees Z1.1 General Requirements Z1.2 Fees  Z1.2 Fees  Z2.1 Design Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.4 Nove the state of th	C2							\$1,388,927
C2.3 Systems & Ancillaries				· ·		•		
D. SITE & ANCILLARY WORK D1 Site Work D1.3 Electrical Site Services D1.3 Electrical Site Services D1.3 Electrical Site Services D1.3 Electrical Site Services D1.4,983 m2 D1.5 Electrical Site Services D1.6 Electrical Site Services D1.7 Electrical		3 3.						
D1 Site Work  D1.3 Electrical Site Services  1.00 4,983 m2 \$55.68 \$277,445  Z. GENERAL REQUIREMENTS & ALLOWANCES  Z1 General Requirements 4.00 4,983 m2 \$156.47 \$779,688 Z1.2 Fees 1.00 4,983 m2 \$74.73 \$372,400  Z2 Allowances  Z2.1 Design Allowance 1.00 4,983 m2 \$500.95 \$2,496,256 Z2.2 Escalation Allowance 1.00 4,983 m2 Excluded Z2.3 Construction Allowance 1.00 4,983 m2 \$153.34 \$764,106	D.	•		,			,	
D1.3 Electrical Site Services  Z. GENERAL REQUIREMENTS & ALLOWANCES  Z1 General Requirements & Fees  Z1.1 General Requirements  Z1.2 Fees  Z1.2 Fees  Z1.1 Design Allowance  Z2.1 Design Allowance  Z2.2 Escalation Allowance  Z2.3 Construction Allowance  Z2.3 Construction Allowance  Z2.4 Services  Z2.5 Services  Z3.5 Services  Z4.7 Services  Z4.8 Services  Z5.7 Services  Z5.8 Servi								\$277,445
Z. GENERAL REQUIREMENTS & ALLOWANCES  Z1 General Requirements & Fees  Z1.1 General Requirements  Z1.2 Fees  Z1.2 Fees  Z2.4 Ilowances  Z2.1 Design Allowance  Z2.2 Escalation Allowance  Z2.3 Construction Allowance  Z2.4 Construction Allowance  Z2.5 GENERAL REQUIREMENTS  \$1.00	1		1 00	4 983	m2	\$55.68	\$277 445	
& ALLOWANCES       \$1,152,0         Z1 General Requirements & Fees       1.00       4,983 m2       \$156.47 \$779,688 \$779,688 \$1.00 \$4,983 m2         Z1.2 Fees       1.00       4,983 m2       \$74.73 \$372,400 \$372,400         Z2 Allowances       \$3,260,3         Z2.1 Design Allowance       1.00       4,983 m2       \$500.95 \$2,496,256 Excluded Ex	7		1.00	1,500		ψ00.00	Ψ=, ι, ττυ	
Z1.1 General Requirements       1.00       4,983 m2       \$156.47 \$779,688         Z1.2 Fees       1.00       4,983 m2       \$74.73 \$372,400         Z2 Allowances       \$3,260,3         Z2.1 Design Allowance       1.00       4,983 m2       \$500.95 \$2,496,256         Z2.2 Escalation Allowance       1.00       4,983 m2       Excluded         Z2.3 Construction Allowance       1.00       4,983 m2       \$153.34       \$764,106								
Z1.2 Fees 1.00 4,983 m2 \$74.73 \$372,400  Z2 Allowances \$2.1 Design Allowance 1.00 4,983 m2 \$500.95 \$2,496,256	Z1	General Requirements & Fees						\$1,152,088
Z2 Allowances       \$3,260,3         Z2.1 Design Allowance       1.00       4,983 m2       \$500.95       \$2,496,256         Z2.2 Escalation Allowance       1.00       4,983 m2       Excluded         Z2.3 Construction Allowance       1.00       4,983 m2       \$153.34       \$764,106		·	1.00			\$156.47	\$779,688	
Z2.1 Design Allowance       1.00       4,983 m2       \$500.95       \$2,496,256         Z2.2 Escalation Allowance       1.00       4,983 m2       Excluded         Z2.3 Construction Allowance       1.00       4,983 m2       \$153.34       \$764,106		Z1.2 Fees	1.00	4,983	m2	\$74.73	\$372,400	
Z2.2 Escalation Allowance       1.00       4,983 m2       Excluded         Z2.3 Construction Allowance       1.00       4,983 m2       \$153.34       \$764,106	Z2	Allowances						\$3,260,362
Z2.3 Construction Allowance 1.00 4,983 m2 \$153.34 \$764,106		_		-				
1,00 1,000 11 7,00,100								
\$200 per of \$46,005,0	<u> </u>	ZZ.O CONSTRUCTION ANDWANCE	1.00	4,963	IIIZ	1		
10tal \$250 per Si \$16,005,0	L	Total				\$298	per sf	\$16,005,000

#### **ELEMENTAL SUMMARY CARBON COSTING STUDY - LOW RISE OFFICE BASE**



\$15,570,000

\$290 per sf

CLASS D ESTIMATE (Rev.3)

NOVEMBER 22, 2018 Gross Floor Area (m2) 4,983 Cost Per m2 3,125 Location: Montreal **Elemental Cost** Description Unit Sub Element A. SHELL A1. Sub-Structure \$527,959 A1.1 Foundations \$527.959 0.33 1.661 m2 \$317.86 A2. Structure \$2,773,205 A2.1 Lowest Floor Construction 1,661 m2 \$86.43 \$143,565 A2.2 Upper Floor Construction 0.67 3,322 m2 \$615.49 \$2,044,659 A2.3 Roof Construction 0.33 1,661 m2 \$352.19 \$584,981 A3. Exterior Enclosure \$1,930,666 A3.2 Walls Above Grade 1,978 m2 \$782.75 \$1,548,278 A3.3 Windows & Entrances 0.00 18 m2 \$3,094.30 \$55,697 A3.4 Roof Finish 0.33 1,661 m2 \$175.91 \$292,191 A3.5 Projections 1.00 4,983 m2 \$34,500 **B. INTERIORS** B1 Partitions & Doors \$109,672 **B1.1 Partitions** \$382.80 \$22,968 0.01 60 m2 B1.2 Doors 0.02 76 m2 \$1,140.84 \$86,704 **B2** Finishes \$771,492 **B2.1 Floor Finishes** 4,734 m2 \$291,658 0.95 \$61.61 B2.2 Ceiling Finishes 0.95 4,734 m2 \$80.49 \$381,062 B2.3 Wall Finishes 1.80 8,969 m2 \$11.01 \$98,772 **B3 Fittings & Equipment** \$850,009 B3.1 Fittings & Fixtures 4,983 m2 \$36.14 \$180.109 1.00 B3.3 Conveying Systems 1.00 4,983 m2 \$134.44 \$669,900 C. SERVICES C1 Mechanical \$2,748,521 C1.1 Plumbing & Drainage 4,983 m2 \$81.35 \$405,354 C1.2 Fire Protection 1.00 4,983 m2 \$28.37 \$141,358 C1.3 Heating, Ventilation, Air Cond. 1.00 4,983 m2 \$389.95 \$1,943,118 C1.4 Controls 1.00 4,983 m2 \$51.91 \$258,691 C2 Electrical \$1,279,092 C2.1 Service & Distribution 4,983 m2 1.00 \$81.04 \$403,828 C2.2 Lighting, Devices & Heating 4,983 m2 \$127.17 \$633,700 1.00 C2.3 Systems & Ancillaries \$241,565 1.00 4,983 m2 \$48.48 D. SITE & ANCILLARY WORK D1 Site Work \$270,933 D1.3 Electrical Site Services 1.00 4,983 m2 \$54.37 \$270,933 GENERAL REQUIREMENTS & ALLOWANCES \$1,125,049 Z1 General Requirements & Fees Z1.1 General Requirements 4,983 m2 \$152.80 \$761,389 Z1.2 Fees 1.00 4,983 m2 \$72.98 \$363,660 **Z2** Allowances \$3,183,843 Z2.1 Design Allowance \$489.20 \$2,437,670 4,983 m2 Z2.2 Escalation Allowance 1.00 4,983 m2 Excluded Z2.3 Construction Allowance 1.00 4,983 m2 \$149.74 \$746,173

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Total

#### **ELEMENTAL SUMMARY**

### CARBON COSTING STUDY - LOW RISE OFFICE BASE



CLASS D ESTIMATE (Rev.3) NOVEMBER 22, 2018

Gross Floor Area (m2) 4,983 Cost Per m2 3,057

						ost Per m2	3,057
					Location :	H	alifax
			i .	Elem	ental Cost		
	scription ement\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
	SHELL	rtatio	quantity	Onic	rtato	Liomone	rotar
	. Sub-Structure						\$484,550
<b> </b> ^'	A1.1 Foundations	0.00	4.004	0	\$004.70	¢404 550	Ψ+0+,550
١. ـ		0.33	1,661	m2	\$291.72	\$484,550	
A2	. Structure						\$2,706,555
	A2.2 Linner Floor Construction	0.33	· · · · · ·		\$84.36	\$140,114	
	A2.2 Upper Floor Construction A2.3 Roof Construction	0.67 0.33	3,322 1,661		\$600.70 \$343.72	\$1,995,519 \$570,922	
Δ3	. Exterior Enclosure	0.55	1,001	1112	ψ343.72	ψ370,922	\$1,884,266
	A3.2 Walls Above Grade	0.40	4.070		<b>#700.04</b>	04 544 007	\$1,004,200
	A3.3 Windows & Entrances	0.40 0.00	,	m2 m2	\$763.94 \$3,019.93	\$1,511,067 \$54,359	
	A3.4 Roof Finish	0.00			\$171.69	\$285,169	
	A3.5 Projections	1.00	,		\$6.76	\$33,671	
В.	INTERIORS						
В1	Partitions & Doors						\$107,036
	B1.1 Partitions	0.01	60	m2	\$373.60	\$22,416	
	B1.2 Doors	0.02	76	m2	\$1,113.43	\$84,620	
В2	Finishes						\$702,980
	B2.1 Floor Finishes	0.95	4,734	m2	\$55.45	\$262,492	
	B2.2 Ceiling Finishes	0.95	,		\$73.11	\$346,106	
	B2.3 Wall Finishes	1.80	8,969	m2	\$10.52	\$94,382	
ВЗ	Fittings & Equipment						\$829,581
	B3.1 Fittings & Fixtures	1.00	4,983	m2	\$35.28	\$175,781	
	B3.3 Conveying Systems	1.00	4,983	m2	\$131.21	\$653,800	
C.	SERVICES						
C1	Mechanical						\$2,751,486
	C1.1 Plumbing & Drainage	1.00	4,983	m2	\$81.44	\$405,792	
	C1.2 Fire Protection	1.00	4,983	m2	\$28.40	\$141,511	
	C1.3 Heating, Ventilation, Air Cond.	1.00	,		\$390.37	\$1,945,214	
	C1.4 Controls	1.00	4,983	m2	\$51.97	\$258,970	
C2	Electrical						\$1,294,386
	C2.1 Service & Distribution	1.00	,		\$82.01	\$408,656	
	C2.2 Lighting, Devices & Heating	1.00	,		\$128.69	\$641,277	
Ļ	C2.3 Systems & Ancillaries	1.00	4,983	m∠	\$49.06	\$244,453	
	SITE & ANCILLARY WORK Site Work						004 400
וטן		4.00	4.000		AE0.00	0004 400	\$264,422
_	D1.3 Electrical Site Services	1.00	4,983	m2	\$53.06	\$264,422	
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$1,098,010
	Z1.1 General Requirements	1.00	4,983	m2	\$149.13	\$743,090	. , ,
	Z1.2 Fees	1.00			\$71.23		
Z2	Allowances						\$3,107,325
	Z2.1 Design Allowance	1.00	4,983	m2	\$477.44	\$2,379,085	
	Z2.2 Escalation Allowance	1.00			Excluded		
L	Z2.3 Construction Allowance	1.00	4,983	m2	\$146.14	\$728,240	
	Total				\$284	per sf	\$15,231,000
ட		I			<del>+-0.</del>		

# ELEMENTAL SUMMARY CARBON COSTING STUDY - LOW RISE OFFICE BASE BUILDING 100% CARBON REDUCTION



4,983

Gross Floor Area (m2)

CLASS D ESTIMATE (Rev.1) NOVEMBER 22, 2018

,		Cost Per m2					
				Location :	Van	couver	
	Elemental Cost						
Description Element\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total	
A. SHELL							
A1. Sub-Structure						\$519,27	
A1.1 Foundations	0.33	1,661	m2	\$312.63	\$519,277		
A2. Structure						\$2,767,40	
A2.1 Lowest Floor Construction	0.33	1,661	m2	\$86.25	\$143,265		
A2.2 Upper Floor Construction	0.67	3,322		\$614.20			
A2.3 Roof Construction	0.33	1,661	m2	\$351.45	\$583,758	00.400.74	
A3. Exterior Enclosure	0.40	4.070		****	21 710 110	\$2,162,73	
A3.2 Walls Above Grade A3.3 Windows & Entrances	0.40	1,978 18	m2 m2	\$884.44 \$3,087.83	\$1,749,418 \$55,581		
A3.4 Roof Finish	0.33	_		\$194.65	\$323,306		
A3.5 Projections	1.00	4,983	m2	\$6.91	\$34,428		
B. INTERIORS							
B1 Partitions & Doors						\$109,4	
B1.1 Partitions	0.01		m2	\$382.00	\$22,920		
B1.2 Doors	0.02	76	m2	\$1,138.46	\$86,523		
B2 Finishes						\$763,4°	
B2.1 Floor Finishes	0.95	4,734		\$65.70	. ,		
B2.2 Ceiling Finishes B2.3 Wall Finishes	0.95 1.80	4,734 8,969		\$76.11 \$10.27	\$360,319 \$92,088		
B3 Fittings & Equipment	1.00	0,909	1112	φ10.27	\$92,000	\$848,2	
B3.1 Fittings & Fixtures	1.00	4,983	m2	\$36.07	¢170 733	Ψ040,Σ	
B3.3 Conveying Systems	1.00	4,983		\$36.07 \$134.16	\$179,733 \$668,500		
C. SERVICES		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			, , , , , , , ,		
C1 Mechanical						\$2,457,29	
C1.1 Plumbing & Drainage	1.00	4,983	m2	\$82.56	\$411,414	+-,,-	
C1.2 Fire Protection	1.00	· ·		\$27.94	. ,		
C1.3 Heating, Ventilation, Air Cond.	1.00	4,983		\$339.43	. , ,		
C1.4 Controls	1.00	4,983	m2	\$43.20	\$215,285		
C2 Electrical						\$1,638,64	
C2.1 Service & Distribution	1.00	4,983		\$88.67	\$441,833		
C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries	1.00 1.00	,		\$192.75 \$47.42	\$960,497 \$236,313		
D. SITE & ANCILLARY WORK		,,,,,		Ψ	4200,010		
D1 Site Work						\$270,36	
D1.3 Electrical Site Services	0.04	200	m2	\$1,351.84	\$270,367	ΨΞ. 0,00	
Z. GENERAL REQUIREMENTS & ALLOWANCES	0.51			÷ 1,55 1.61	+=: 0,007		
Z1 General Requirements & Fees						\$1,161,08	
Z1.1 General Requirements	1.00	4,983	m2	\$157.69	\$785,774		
Z1.2 Fees	1.00	4,983	m2	\$75.32	\$375,315		
Z2 Allowances						\$3,287,58	
Z2.1 Design Allowance	1.00	,		\$505.21	\$2,517,476		
Z2.2 Escalation Allowance	1.00	· ·		Excluded			
Z2.3 Construction Allowance	1.00	4,983	m2	\$154.55	\$770,112		
Total				\$298	per sf	\$15,985,00	

A.W. HOOKER ASSOCIATES LTD. PROJECT NO:116065 PAGE C1 A.W. HOOKER ASSOCIATES LTD. PROJECT NO:116065 PAGE C1

# ELEMENTAL SUMMARY CARBON COSTING STUDY - LOW RISE OFFICE BASE BUILDING 100% CARBON REDUCTION



CLASS D ESTIMATE (Rev.1) NOVEMBER 22, 2018

Gross Floor Area (m2) 4,983 Cost Per m2 3.385

				С	ost Per m2	3,385
				Location :	C	algary
B			Elem	ental Cost		
Description Element\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A. SHELL						
A1. Sub-Structure						\$569,739
A1.1 Foundations	0.33	1,661	m2	\$343.01	\$569,739	
A2. Structure						\$2,886,219
A2.1 Lowest Floor Construction	0.33	1,661	m2	\$89.96	\$149,415	
A2.2 Upper Floor Construction	0.67	3,322	m2	\$640.57	\$2,127,984	
A2.3 Roof Construction	0.33	1,661	m2	\$366.54	\$608,820	
A3. Exterior Enclosure						\$2,255,582
A3.2 Walls Above Grade	0.40	1,978		\$922.41	\$1,824,524	
A3.3 Windows & Entrances A3.4 Roof Finish	0.00		m2	\$3,220.40		
A3.5 Projections	0.33 1.00	1,661 4,983		\$203.00 \$7.21	\$337,186 \$35,906	
B. INTERIORS		.,000		Ų <u>.</u> .	<b>\$</b> 00,000	
B1 Partitions & Doors						\$114,142
B1.1 Partitions	0.01	60	m2	\$398.40	\$23,904	ψ11 <del>4</del> ,142
B1.2 Doors	0.01		m2	\$1,187.34	\$90,238	
B2 Finishes					, , , , ,	\$813,241
B2.1 Floor Finishes	0.95	4,734	m2	\$64.35	\$304,652	¥3.13,= 11
B2.2 Ceiling Finishes	0.95	4,734		\$84.71	\$401,037	
B2.3 Wall Finishes	1.80	8,969	m2	\$11.99	\$107,552	
B3 Fittings & Equipment						\$884,649
B3.1 Fittings & Fixtures	1.00	4,983		\$37.62	\$187,449	
B3.3 Conveying Systems	1.00	4,983	m2	\$139.92	\$697,200	
C. SERVICES						
C1 Mechanical						\$2,626,859
C1.1 Plumbing & Drainage	1.00	4,983		\$88.26	\$439,803	
C1.2 Fire Protection C1.3 Heating, Ventilation, Air Cond.	1.00 1.00	4,983 4,983		\$29.87 \$362.85	\$148,830 \$1,808,084	
C1.4 Controls	1.00	4,983		\$46.19	\$230,141	
C2 Electrical						\$1,793,405
C2.1 Service & Distribution	1.00	4,983	m2	\$97.04	\$483,562	
C2.2 Lighting, Devices & Heating	1.00	4,983		\$210.96	\$1,051,211	
C2.3 Systems & Ancillaries	1.00	4,983	m2	\$51.90	\$258,632	
D. SITE & ANCILLARY WORK						
D1 Site Work						\$281,975
D1.3 Electrical Site Services	0.04	200	m2	\$1,409.87	\$281,975	
Z. GENERAL REQUIREMENTS & ALLOWANCES						
Z1 General Requirements & Fees						\$1,210,937
Z1.1 General Requirements	1.00	4,983	m2	\$164.46	\$819,509	
Z1.2 Fees	1.00	4,983	m2	\$78.55	\$391,428	
Z2 Allowances						\$3,428,730
Z2.1 Design Allowance	1.00	4,983		\$526.90	\$2,625,556	
Z2.2 Escalation Allowance	1.00	4,983		Excluded		
Z2.3 Construction Allowance	1.00	4,983	m2	\$161.18	\$803,174	
Total				\$314	per sf	\$16,865,000

# ELEMENTAL SUMMARY CARBON COSTING STUDY - LOW RISE OFFICE BASE BUILDING 100% CARBON REDUCTION



CLASS D ESTIMATE (Rev.1)

	ASS D ESTIMATE (Rev.1)  VEMBER 22, 2018				Gross Floor	· Δrea (m2)	4,983
.,,	7 V LIVID LI ( 22, 2010		3,398				
			oronto				
Das	scription			Elem	ental Cost Unit	Sub	Element
	ment\Sub-Element	Ratio	Quantity	Unit	Rate	Element	Total
Α.	SHELL						
A1.	Sub-Structure						\$542,609
	A1.1 Foundations	0.33	1,661	m2	\$326.68	\$542,609	,
Α2	Structure	0.00	.,		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	<b>40</b> ,000	\$2,897,811
	A2.1 Lowest Floor Construction	0.33	1,661	m2	\$90.32	\$150,016	<del></del>
	A2.2 Upper Floor Construction	0.67	3,322		\$643.15	\$2,136,530	
	A2.3 Roof Construction	0.33	1,661		\$368.01	\$611,265	
А3.	Exterior Enclosure						\$2,264,641
	A3.2 Walls Above Grade	0.40	1,978	m2	\$926.11	\$1,831,851	
	A3.3 Windows & Entrances	0.00		m2	\$3,233.33	\$58,200	
	A3.4 Roof Finish	0.33	1,661		\$203.82	\$338,540	
	A3.5 Projections	1.00	4,983	m2	\$7.23	\$36,050	
В.	INTERIORS						
В1	Partitions & Doors						\$114,600
	B1.1 Partitions	0.01	60	m2	\$400.00	\$24,000	
	B1.2 Doors	0.02		m2	\$1,192.11	\$90,600	
В2	Finishes						\$772,675
	B2.1 Floor Finishes	0.95	4,734	m2	\$61.00	\$288,770	
	B2.2 Ceiling Finishes	0.95	4,734		\$81.14	\$384,135	
	B2.3 Wall Finishes	1.80	8,969		\$11.12	\$99,770	
В3	Fittings & Equipment						\$888,202
	B3.1 Fittings & Fixtures	1.00	4,983	m2	\$37.77	\$188,202	
	B3.3 Conveying Systems	1.00	4,983		\$140.48	\$700,000	
C.	SERVICES						
C1	Mechanical						\$2,691,454
	C1.1 Plumbing & Drainage	1.00	4,983	m2	\$90.43	\$450,618	<del></del>
	C1.2 Fire Protection	1.00	4,983		\$30.60	\$152,490	
	C1.3 Heating, Ventilation, Air Cond.	1.00	4,983		\$371.77	\$1,852,546	
	C1.4 Controls	1.00	4,983	m2	\$47.32	\$235,800	
C2	Electrical						\$1,820,716
	C2.1 Service & Distribution	1.00	4,983	m2	\$98.52	\$490,926	
	C2.2 Lighting, Devices & Heating	1.00	4,983		\$214.17		
	C2.3 Systems & Ancillaries	1.00	4,983	m2	\$52.69	\$262,570	
D.	SITE & ANCILLARY WORK						
D1	Site Work						\$283,107
	D1.3 Electrical Site Services	0.04	200	m2	\$1,415.54	\$283,107	
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$1,215,800
	Z1.1 General Requirements	1.00	4,983	m2	\$165.12	\$822,800	
	Z1.2 Fees	1.00	4,983		\$78.87	\$393,000	
<b>Z</b> 2	Allowances						\$3,442,500
	Z2.1 Design Allowance	1.00	4,983	m2	\$529.02	\$2,636,100	, , , , , ,
	Z2.2 Escalation Allowance	1.00	4,983		Excluded	ψ <u>~</u> ,000,100	
	Z2.3 Construction Allowance	1.00	4,983		\$161.83	\$806,400	
	Total	1		!	<b>¢</b> 21£	per sf	\$16,934,000
	· otal	1			φυισ	וכ וטק	<del>\$ 10,334,0</del> 00

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# ELEMENTAL SUMMARY CARBON COSTING STUDY - LOW RISE OFFICE BASE BUILDING 100% CARBON REDUCTION



CLASS D ESTIMATE (Rev.1) NOVEMBER 22, 2018

Gross Floor Area (m2) 4,983

				с	ost Per m2	3,324
				Location:	0	ttawa
	Elemental Cost					
Description Element\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A. SHELL						
A1. Sub-Structure						\$527,959
A1.1 Foundations	0.33	1,661	m2	\$317.86	\$527,959	
A2. Structure						\$2,839,854
A2.1 Lowest Floor Construction	0.33	1,661	m2	\$88.51	\$147,015	, ,,.
A2.2 Upper Floor Construction	0.67	3,322		\$630.28	\$2,093,799	
A2.3 Roof Construction	0.33	1,661	m2	\$360.65	\$599,040	
A3. Exterior Enclosure						\$2,219,348
A3.2 Walls Above Grade	0.40	1,978	m2	\$907.59	\$1,795,214	
A3.3 Windows & Entrances	0.00	18	m2	\$3,168.67	\$57,036	
A3.4 Roof Finish	0.33	1,661		\$199.74	\$331,769	
A3.5 Projections	1.00	4,983	m2	\$7.09	\$35,329	
B. INTERIORS						
B1 Partitions & Doors						\$112,308
B1.1 Partitions	0.01		m2	\$392.00	\$23,520	
B1.2 Doors	0.02	76	m2	\$1,168.26	\$88,788	
B2 Finishes						\$731,404
B2.1 Floor Finishes	0.95	4,734		\$58.25	\$275,775	
B2.2 Ceiling Finishes B2.3 Wall Finishes	0.95	4,734		\$75.95	\$359,550	
	1.80	8,969	1112	\$10.71	\$96,079	4070 400
B3 Fittings & Equipment			_			\$870,438
B3.1 Fittings & Fixtures B3.3 Conveying Systems	1.00 1.00	4,983 4,983		\$37.01 \$137.67	\$184,438 \$686,000	
C. SERVICES						
C1 Mechanical						\$2,602,636
C1.1 Plumbing & Drainage	1.00	4,983	m2	\$87.45	\$435,748	
C1.2 Fire Protection	1.00	4,983	m2	\$29.59	\$147,458	
C1.3 Heating, Ventilation, Air Cond.	1.00	4,983		\$359.50	\$1,791,412	
C1.4 Controls	1.00	4,983	m2	\$45.76	\$228,019	
C2 Electrical						\$1,818,895
C2.1 Service & Distribution	1.00	4,983		\$98.42	\$490,435	
C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries	1.00 1.00	4,983		\$213.96 \$52.64	\$1,066,152 \$262,308	
D. SITE & ANCILLARY WORK	1.00	4,983	IIIZ	\$52.04	\$202,300	
						0077.445
D1 Site Work		25-	_	04.007.55	40== 1:=	\$277,445
D1.3 Electrical Site Services	0.04	200	m2	\$1,387.22	\$277,445	
Z. GENERAL REQUIREMENTS & ALLOWANCES						
Z1 General Requirements & Fees						\$1,191,484
Z1.1 General Requirements Z1.2 Fees	1.00 1.00	4,983 4,983		\$161.82 \$77.29	\$806,344 \$385,140	
Z2 Allowances	1.00	7,300	/// <u>/</u>	ψ11.29	ψ505, 140	\$2.272.6E0
			_	<b>^-</b> 10 · ·	00 500 055	\$3,373,650
Z2.1 Design Allowance Z2.2 Escalation Allowance	1.00 1.00	4,983 4,983		\$518.44 Excluded	\$2,583,378	
Z2.3 Construction Allowance	1.00	4,983		\$158.59	\$790,272	
Total		1	1	\$309	per sf	\$16,565,000
. 5001				ΨΟΟΘ	PO: 01	Ψ 10,000,000

# ELEMENTAL SUMMARY CARBON COSTING STUDY - LOW RISE OFFICE BASE BUILDING 100% CARBON REDUCTION



\$300 per sf

\$16,099,000

NOVEMBER 22, 2018				Gross Floor		4,983
					ost Per m2	3,231
			Flem	Location : ental Cost	INIO	ntreal
Description			Licini	Unit	Sub	Element
Element\Sub-Element	Ratio	Quantity	Unit	Rate	Element	Total
A. SHELL						
A1. Sub-Structure						\$527,959
A1.1 Foundations	0.33	1,661	m2	\$317.86	\$527,959	
A2. Structure						\$2,773,20
A2.1 Lowest Floor Construction	0.33	1,661	m2	\$86.43	\$143,565	
A2.2 Upper Floor Construction	0.67	3,322		\$615.49	\$2,044,659	
A2.3 Roof Construction	0.33	1,661	m2	\$352.19	\$584,981	
A3. Exterior Enclosure						\$2,167,26
A3.2 Walls Above Grade	0.40	1,978		\$886.29	\$1,753,081	
A3.3 Windows & Entrances A3.4 Roof Finish	0.00 0.33	18 1,661	m2 m2	\$3,094.30 \$195.05	\$55,697 \$323,983	
A3.5 Projections	1.00	4,983		\$6.92	\$323,903	
3. INTERIORS		,		·	. ,	
31 Partitions & Doors						\$109,672
B1.1 Partitions	0.01	60	m2	\$382.80	\$22,968	<del>- + + + + + + + + + + + + + + + + + + +</del>
B1.2 Doors	0.02		m2	\$1,140.84	\$86,704	
32 Finishes						\$771,49
B2.1 Floor Finishes	0.95	4,734	m2	\$61.61	\$291,658	. , .
B2.2 Ceiling Finishes	0.95	4,734		\$80.49	\$381,062	
B2.3 Wall Finishes	1.80	8,969	m2	\$11.01	\$98,772	
33 Fittings & Equipment						\$850,009
B3.1 Fittings & Fixtures	1.00	4,983	m2	\$36.14	\$180,109	
B3.3 Conveying Systems	1.00	4,983	m2	\$134.44	\$669,900	
C. SERVICES						
C1 Mechanical						\$2,494,977
C1.1 Plumbing & Drainage	1.00	4,983	m2	\$83.83	\$417,723	
C1.2 Fire Protection	1.00	4,983		\$28.37	\$141,358	
C1.3 Heating, Ventilation, Air Cond. C1.4 Controls	1.00 1.00	4,983 4,983		\$344.63 \$43.87	\$1,717,310 \$218,587	
C2 Electrical	1.00	4,303	1112	ψ+3.07	Ψ2 10,307	\$1,675,05
C2.1 Service & Distribution	1.00	4.002	O	<b>#00.64</b>	¢454.650	\$1,073,030
C2.2 Lighting, Devices & Heating	1.00 1.00	4,983 4,983		\$90.64 \$197.04	\$451,652 \$981,842	
C2.3 Systems & Ancillaries	1.00	4,983		\$48.48	\$241,565	
D. SITE & ANCILLARY WORK						
01 Site Work						\$270,93
D1.3 Electrical Site Services	0.04	200	m2	\$1,354.67	\$270,933	
Z. GENERAL REQUIREMENTS & ALLOWANCES				. ,		
Z1 General Requirements & Fees						\$1,163,52°
Z1.1 General Requirements	1.00	4,983	m2	\$158.02	\$787,420	, ,
Z1.2 Fees	1.00	4,983		\$75.48	\$376,101	
Z2 Allowances						\$3,294,47
Z2.1 Design Allowance	1.00	4,983	m2	\$506.27	\$2,522,748	
Z2.2 Escalation Allowance	1.00	4,983		Excluded		
Z2.3 Construction Allowance	1.00	4,983	m2	\$154.87	\$771,725	

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Total

#### **ELEMENTAL SUMMARY CARBON COSTING STUDY - LOW RISE OFFICE BASE BUILDING 100% CARBON** REDUCTION



4,983

Gross Floor Area (m2)

CLASS D ESTIMATE (Rev.1) NOVEMBER 22, 2018

D. SITE & ANCILLARY WORK

D1.3 Electrical Site Services

Z1.1 General Requirements

& ALLOWANCES Z1 General Requirements & Fees

Z2.1 Design Allowance

Z2.2 Escalation Allowance

Z2.3 Construction Allowance

Z. GENERAL REQUIREMENTS

D1 Site Work

Z1.2 Fees

Z2 Allowances

Total

Cost Per m2 3,162 Location: **Elemental Cost** Element Description Sub Element\Sub-Elemen Total A. SHELL A1. Sub-Structure \$484,550 A1.1 Foundations 1,661 m2 0.33 \$291.72 \$484,550 A2. Structure \$2,706,555 A2.1 Lowest Floor Construction 1,661 m2 0.33 \$84.36 \$140,114 A2.2 Upper Floor Construction 0.67 3,322 m2 \$1,995,519 \$600.70 A2.3 Roof Construction 0.33 1,661 m2 \$343.72 \$570,922 A3. Exterior Enclosure \$2,115,175 A3.2 Walls Above Grade 1,978 m2 0.40 \$864.99 \$1,710,949 A3.3 Windows & Entrances 0.00 \$3,019.93 \$54,359 18 m2 A3.4 Roof Finish 0.33 1,661 m2 \$190.37 \$316,196 A3.5 Projections 1.00 4,983 m2 \$6.76 \$33,671 B. INTERIORS **B1 Partitions & Doors** \$107,036 **B1.1 Partitions** 0.01 60 m2 \$373.60 \$22,416 B1.2 Doors 0.02 76 m2 \$1,113.43 \$84,620 **B2** Finishes \$702,980 B2.1 Floor Finishes 0.95 4,734 m2 \$55.45 \$262,492 **B2.2 Ceiling Finishes** 0.95 4,734 m2 \$73.11 \$346,106 B2.3 Wall Finishes 1.80 8,969 m2 \$10.52 \$94,382 \$829,581 B3 Fittings & Equipment B3.1 Fittings & Fixtures 1.00 4,983 m2 \$35.28 \$175,781 B3.3 Conveying Systems 1.00 4.983 m2 \$131.21 \$653.800 C. SERVICES C1 Mechanical \$2,497,669 C1.1 Plumbing & Drainage 1.00 4,983 m2 \$83.92 \$418,174 C1.2 Fire Protection 1.00 4,983 m2 \$28.40 \$141,511 C1.3 Heating, Ventilation, Air Cond. 1.00 4,983 m2 \$345.01 \$1,719,162 C1.4 Controls 1.00 4,983 m2 \$43.91 \$218,822 C2 Electrical \$1,695,086 C2.1 Service & Distribution 1.00 4,983 m2 \$91.72 \$457,052 C2.2 Lighting, Devices & Heating 1.00 4,983 m2 \$199.39 \$993,581 C2.3 Systems & Ancillaries 1.00

4,983 m2

200 m2

4,983 m2

4,983 m2

4,983 m2

4,983 m2

4,983 m2

0.04

1.00

1.00

1.00

1.00

1.00

\$49.06

\$1,322.1

\$154.22

\$73.66

\$494.10

\$151.15

\$294 per sf

Excluded

\$244,453

\$264,422

\$768,495

\$367,062

\$2,462,117

\$753,178

\$264,422

\$1,135,557

\$3,215,295

\$15,754,000

ELEMENTAL SUMMARY
CARBON COSTING STUDY - LOW RISE
MURB BASE

.W. HOOKER ®

CLASS D ESTIMATE (Rev.3) NOVEMBER 22, 2018

Gross Floor Area (m2)	3,135
Cost Per m2	3,117

						UST PET IIIZ	3,117	
		Location : Val					ncouver	
Das	Description			Elem	Unit	Sub	Element	
	ment\Sub-Element	Ratio	Quantity	Unit	Rate	Element	Total	
	SHELL							
	. Sub-Structure						£2.42.204	
AT.							\$242,301	
	A1.1 Foundations	0.25	784	m2	\$309.06	\$242,301		
A2.	. Structure						\$1,289,250	
	A2.1 Lowest Floor Construction	0.25		m2	\$90.73	\$71,131		
	A2.2 Upper Floor Construction	0.75			\$406.72	\$956,196		
	A2.3 Roof Construction	0.25	784	m2	\$334.08	\$261,922		
A3.	Exterior Enclosure						\$1,041,93	
	A3.2 Walls Above Grade	0.46	· ·		\$529.56	\$767,327		
	A3.3 Windows & Entrances	0.04		m2	\$832.55	\$108,822		
	A3.4 Roof Finish A3.5 Projections	0.25		m2	\$177.84	\$139,430		
_	•	1.00	3,135	m2	\$8.41	\$26,358		
	INTERIORS							
B1	Partitions & Doors						\$933,231	
	B1.1 Partitions	1.40	,		\$166.79	\$733,254		
	B1.2 Doors	0.18	551	m2	\$363.05	\$199,977		
B2	Finishes						\$537,570	
	B2.1 Floor Finishes	1.00	3,135	m2	\$97.68	\$306,216		
	B2.2 Ceiling Finishes	1.00	3,135		\$43.93	\$137,736		
	B2.3 Wall Finishes	2.13	6,669	m2	\$14.04	\$93,618		
ВЗ	Fittings & Equipment						\$635,342	
	B3.1 Fittings & Fixtures	1.00	3,135	m2	\$114.93	\$360,302		
	B3.3 Conveying Systems	1.00	3,135	m2	\$87.73	\$275,040		
C.	SERVICES							
C1	Mechanical						\$1,354,652	
	C1.1 Plumbing & Drainage	1.00	3,135	m2	\$205.98	\$645,732		
	C1.2 Fire Protection	1.00	3,135		\$28.43	\$89,125		
	C1.3 Heating, Ventilation, Air Cond.	1.00	3,135	m2	\$192.78	\$604,360		
	C1.4 Controls	1.00	3,135	m2	\$4.92	\$15,435		
C2	Electrical						\$617,16 <sup>2</sup>	
	C2.1 Service & Distribution	1.00	3,135	m2	\$45.85	\$143,748		
	C2.2 Lighting, Devices & Heating	1.00	3,135		\$61.01	\$191,270		
	C2.3 Systems & Ancillaries	1.00	3,135	m2	\$90.00	\$282,143		
D.	SITE & ANCILLARY WORK							
D1	Site Work						\$71,008	
	D1.3 Electrical Site Services	1.00	3,135	m2	\$22.65	\$71,008		
Z.	GENERAL REQUIREMENTS							
	& ALLOWANCES							
<b>Z</b> 1	General Requirements & Fees						\$1,031,400	
	Z1.1 General Requirements	1.00	3,135	m2	\$210.19	\$658,950		
	Z1.2 Fees	1.00			\$118.80	\$372,450		
<b>Z</b> 2	Allowances						\$2,017,15	
	Z2.1 Design Allowance	1.00	3,135	m2	\$493.95	\$1,548,533		
	Z2.2 Escalation Allowance	1.00			Excluded			
	Z2.3 Construction Allowance	1.00			\$149.48			
	Total		<u>l</u>		£200	per sf	\$0.774.000	
	Total			\$9,771,000				

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#### **ELEMENTAL SUMMARY CARBON COSTING STUDY - LOW RISE MURB BASE**



CLASS D ESTIMATE (Rev.3) NOVEMBER 22, 2018

Gross Floor Area (m2) 3,135 Cost Per m2 3.277

						ost Per m2	3,277
					Location:	С	algary
				Elem	ental Cost		
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A.	SHELL						
A1	. Sub-Structure						\$265,847
	A1.1 Foundations	0.25	784	m2	\$339.09	\$265,847	
١,,	. Structure	0.20	704		φοσσ.σσ	Ψ200,047	
^_				_		4	\$1,344,600
	A2.1 Lowest Floor Construction A2.2 Upper Floor Construction	0.25 0.75	784 2.351	m2	\$94.62 \$424.18	. ,	
	A2.3 Roof Construction	0.75	,	m2	\$348.43	,	
Δ3	. Exterior Enclosure	0.20			\$0.0.10	<b>\$2.0,10.</b>	\$1,086,670
\\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	A3.2 Walls Above Grade	0.40	4 440	0	<b>#</b> FF0.00	#000 070	
	A3.3 Windows & Entrances	0.46 0.04		m2 m2	\$552.29 \$868.29		
	A3.4 Roof Finish	0.25		m2	\$185.48		
	A3.5 Projections	1.00	3,135	m2	\$8.77	\$27,490	
В.	INTERIORS						
В1	Partitions & Doors						\$973,296
	B1.1 Partitions	1.40	4,396	m2	\$173.95	\$764,734	
	B1.2 Doors	0.18	551	m2	\$378.63	\$208,562	
В2	Finishes						\$562,602
	B2.1 Floor Finishes	1.00	3,135	m2	\$95.68	\$299,961	
	B2.2 Ceiling Finishes	1.00	3,135		\$48.90		
	B2.3 Wall Finishes	2.13	6,669	m2	\$16.40	\$109,339	
В3	Fittings & Equipment						\$662,619
	B3.1 Fittings & Fixtures	1.00			\$119.86		
	B3.3 Conveying Systems	1.00	3,135	m2	\$91.50	\$286,848	
	SERVICES						
C1	Mechanical						\$1,448,128
	C1.1 Plumbing & Drainage	1.00		l	\$220.19		
	C1.2 Fire Protection	1.00	3,135		\$30.39	. ,	
	C1.3 Heating, Ventilation, Air Cond. C1.4 Controls	1.00 1.00	3,135 3,135		\$206.08 \$5.26	\$646,063 \$16,501	
	Electrical	1.00	0,100		ψ0.20	Ψ10,001	
		4.00	0.405	_	250.40	<b>*</b> 455.004	\$675,448
	C2.1 Service & Distribution C2.2 Lighting, Devices & Heating	1.00 1.00	3,135 3,135		\$50.18 \$66.77	\$157,324 \$209,334	
	C2.3 Systems & Ancillaries	1.00			\$98.50		
D.	SITE & ANCILLARY WORK						
D1	Site Work						\$74,057
	D1.3 Electrical Site Services	1.00	3,135	m2	\$23.62	\$74,057	
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$1,075,680
	Z1.1 General Requirements	1.00	3,135	m2	\$219.22	\$687,240	
	Z1.2 Fees	1.00			\$123.90	,	
Z2	Allowances						\$2,103,751
	Z2.1 Design Allowance	1.00	3,135	m2	\$515.16	\$1,615,014	
	Z2.2 Escalation Allowance	1.00			Excluded		
	Z2.3 Construction Allowance	1.00	3,135	m2	\$155.90	\$488,737	
	Total				\$304	per sf	\$10,273,000

#### **ELEMENTAL SUMMARY CARBON COSTING STUDY - LOW RISE**



CLASS D ESTIMATE (Rev.3)

C1.1 Plumbing & Drainage

C2.1 Service & Distribution

C2.3 Systems & Ancillaries

D1.3 Electrical Site Services

& ALLOWANCES

GENERAL REQUIREMENTS

Z1 General Requirements & Fees

Z1.1 General Requirements

Z2.1 Design Allowance

Z2.2 Escalation Allowance

Z2.3 Construction Allowance

D. SITE & ANCILLARY WORK

C2.2 Lighting, Devices & Heating

C1.3 Heating, Ventilation, Air Cond.

C1.2 Fire Protection

C1.4 Controls

C2 Electrical

D1 Site Work

Z1.2 Fees

**Z2** Allowances

Total

**MURB BASE** NOVEMBER 22, 2018 Gross Floor Area (m2) 3,135 Cost Per m2 3,287 Location: Toronto **Elemental Cost** Description Unit Sub Element A. SHELL \$253,188 A1. Sub-Structure A1.1 Foundations \$253.188 0.25 784 m2 \$322.94 A2. Structure \$1,350,000 A2.1 Lowest Floor Construction 784 m2 \$95.00 \$74,483 A2.2 Upper Floor Construction 0.75 2,351 m2 \$425.88 \$1,001,253 A2.3 Roof Construction 0.25 \$274,264 784 m2 \$349.83 A3. Exterior Enclosure \$1,091,034 A3.2 Walls Above Grade 1,449 m2 \$554.51 \$803,484 A3.3 Windows & Entrances 131 m2 \$871.78 \$113,950 0.04 A3.4 Roof Finish 0.25 784 m2 \$186.22 \$146,000 A3.5 Projections 1.00 3,135 m2 \$27,600 **B. INTERIORS** B1 Partitions & Doors \$977,205 **B1.1 Partitions** \$174.65 \$767,805 4,396 m2 B1.2 Doors 0.18 551 m2 \$380.15 \$209,400 **B2** Finishes \$532,592 **B2.1 Floor Finishes** 3,135 m2 \$284,324 \$90.69 B2.2 Ceiling Finishes 3,135 m2 \$46.84 \$146,840 B2.3 Wall Finishes 2.13 6,669 m2 \$15.21 \$101,428 **B3 Fittings & Equipment** \$665,280 B3.1 Fittings & Fixtures 3,135 m2 \$120.34 \$377.280 1.00 B3.3 Conveying Systems 1.00 3,135 m2 \$91.87 \$288,000 C. SERVICES C1 Mechanical \$1,483,737

3,135 m2

1.00

1.00

1.00

1.00

1.00

1.00

1.00

1.00

1.00

1.00

\$225.60

\$31.14

\$211.15

\$5.39

\$50.95

\$67.79

\$100.00

\$23.72

\$220.10

\$124.40

\$517.22

\$156.52

\$305 per sf

Excluded

\$707,264

\$97,618

\$661,950

\$16,906

\$159,720

\$212,522

\$313,492

\$74,354

\$690,000

\$390,000

\$1,621,500

\$490,700

\$685,734

\$74,354

\$1,080,000

\$2,112,200

\$10,305,000

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## ELEMENTAL SUMMARY CARBON COSTING STUDY - LOW RISE MURB BASE



CLASS D ESTIMATE (Rev.3) NOVEMBER 22, 2018

Gross Floor Area (m2) 3,135 Cost Per m2 3,214

						ost Per m2	3,214
					Location :	0	ttawa
				Elem	ental Cost		
Descrip Elemen	otion nt\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A. SH	IELL						
A1. Su	b-Structure						\$246,352
A1.	1 Foundations	0.25	784	m2	\$314.22	\$246,352	
	ucture	0.20	701		<b>\$011.22</b>	Ψ2 10,002	\$1,323,000
	1 Lowest Floor Construction	0.05	704	m2	\$93.10	¢70.004	ψ1,323,000
	2 Upper Floor Construction	0.25 0.75	2,351	l	\$93.10 \$417.37	. ,	
	3 Roof Construction	0.25	,	m2	\$342.83	\$268,779	
A3. Ext	terior Enclosure						\$1,069,214
A3.	2 Walls Above Grade	0.46	1,449	m2	\$543.42	\$787,415	
A3.	3 Windows & Entrances	0.04	,	m2	\$854.34		
A3.	4 Roof Finish	0.25	784	m2	\$182.50	\$143,080	
A3.	5 Projections	1.00	3,135	m2	\$8.63	\$27,048	
B. IN	TERIORS						
B1 Pa	rtitions & Doors						\$957,661
B1.	1 Partitions	1.40	4,396	m2	\$171.15	\$752,449	
B1.	2 Doors	0.18	551	m2	\$372.55	\$205,212	
B2 Fin	nishes						\$506,646
B2.	1 Floor Finishes	1.00	3,135	m2	\$86.61	\$271,529	
	2 Ceiling Finishes	1.00	3,135	l	\$43.84		
B2.	3 Wall Finishes	2.13	6,669	m2	\$14.65	\$97,675	
B3 Fitt	tings & Equipment						\$651,974
	1 Fittings & Fixtures	1.00	3,135	l	\$117.94	\$369,734	
	3 Conveying Systems	1.00	3,135	m2	\$90.03	\$282,240	
C. SE	RVICES						
C1 Me	chanical						\$1,434,774
C1.	1 Plumbing & Drainage	1.00	3,135	m2	\$218.16	\$683,924	
	2 Fire Protection	1.00	3,135		\$30.11	\$94,396	
	.3 Heating, Ventilation, Air Cond4 Controls	1.00 1.00	3,135 3,135	l	\$204.18 \$5.21	\$640,105 \$16,348	
		1.00	3,133	1112	φ5.21	\$10,540	*COF 040
	ectrical						\$685,048
	.1 Service & Distribution .2 Lighting, Devices & Heating	1.00 1.00	3,135 3,135	l	\$50.90 \$67.72	\$159,560 \$212,310	
	3 Systems & Ancillaries	1.00			\$99.90		
	TE & ANCILLARY WORK		,			, , ,	
	e Work						\$72,867
	3 Electrical Site Services	1.00	3,135	m2	\$23.24	\$72,867	<b>4.2,00</b> .
	ENERAL REQUIREMENTS	1.00	3,133	1112	Ψ20.24	Ψ12,001	
	ALLOWANCES						
Z1 Ge	neral Requirements & Fees						\$1,058,400
	1 General Requirements	1.00	3,135	m2	\$215.69	\$676,200	
Z1.:	2 Fees	1.00	3,135	l	\$121.91	\$382,200	
Z2 All	owances						\$2,069,956
Z2.	1 Design Allowance	1.00	3,135	m2	\$506.88	\$1,589,070	
Z2.:	2 Escalation Allowance	1.00	3,135		Excluded		
Z2.	3 Construction Allowance	1.00	3,135	m2	\$153.39	\$480,886	
To	tal				\$299	per sf	\$10,076,000

## ELEMENTAL SUMMARY CARBON COSTING STUDY - LOW RISE MURB BASE



\$2,021,375

\$9,820,000

\$494.98

\$149.79

\$291 per sf

Excluded

3,135 m2

3,135 m2

3,135 m2

1.00

1.00

\$1,551,776

\$469,600

CLASS D ESTIMATE (Rev.3)

NOVEMBER 22, 2018 Gross Floor Area (m2) 3,135 Cost Per m2 3,132 Location: Montreal **Elemental Cost** Description Unit Sub Element A. SHELL A1. Sub-Structure \$246,352 A1.1 Foundations \$246.352 0.25 784 m2 \$314.22 A2. Structure \$1,291,950 A2.1 Lowest Floor Construction 784 m2 \$90.92 \$71,280 A2.2 Upper Floor Construction 0.75 2,351 m2 \$407.57 \$958,199 A2.3 Roof Construction 0.25 784 m2 \$334.78 \$262,471 A3. Exterior Enclosure \$1,044,120 A3.2 Walls Above Grade 1,449 m2 \$530.67 \$768,934 A3.3 Windows & Entrances 131 m2 \$834.29 \$109,050 0.04 A3.4 Roof Finish 0.25 784 m2 \$178.22 \$139,722 A3.5 Projections 1.00 3,135 m2 \$8.43 \$26,413 **B. INTERIORS** B1 Partitions & Doors \$935,185 **B1.1 Partitions** \$167.14 \$734,790 4,396 m2 B1.2 Doors 0.18 551 m2 \$363.81 \$200,396 **B2** Finishes \$533,246 **B2.1 Floor Finishes** 3,135 m2 \$91.60 \$287,167 B2.2 Ceiling Finishes 3,135 m2 \$46.46 \$145,665 B2.3 Wall Finishes 2.13 6,669 m2 \$15.06 \$100,414 **B3 Fittings & Equipment** \$636,673 B3.1 Fittings & Fixtures 3,135 m2 \$115.17 \$361.057 1.00 B3.3 Conveying Systems 1.00 3,135 m2 \$87.92 \$275,616 C. SERVICES C1 Mechanical \$1,375,424 C1.1 Plumbing & Drainage 3,135 m2 \$209.13 \$655,633 C1.2 Fire Protection 1.00 3,135 m2 \$28.86 \$90,491 C1.3 Heating, Ventilation, Air Cond. 1.00 3,135 m2 \$195.73 \$613,627 C1.4 Controls 1.00 3,135 m2 \$5.00 \$15,672 C2 Electrical \$630,875 C2.1 Service & Distribution 3,135 m2 \$146,942 1.00 \$46.87 C2.2 Lighting, Devices & Heating 3,135 m2 \$62.37 \$195,520 1.00 C2.3 Systems & Ancillaries 1.00 3,135 m2 \$92.00 \$288,413 D. SITE & ANCILLARY WORK D1 Site Work \$71,157 D1.3 Electrical Site Services 1.00 3,135 m2 \$22.70 \$71,157 GENERAL REQUIREMENTS & ALLOWANCES \$1,033,560 Z1 General Requirements & Fees Z1.1 General Requirements 3,135 m2 \$210.63 \$660,330 Z1.2 Fees 3,135 m2 1.00 \$119.05 \$373,230

A.W. HOOKER ASSOCIATES LTD. PROJECT NO:116065 PAGE C1 A.W. HOOKER ASSOCIATES LTD. PROJECT NO:116065 PAGE C1

**Z2** Allowances

Total

Z2.1 Design Allowance

Z2.2 Escalation Allowance

Z2.3 Construction Allowance

## CARBON COSTING STUDY - LOW RISE MURB BASE



CLASS D ESTIMATE (Rev.3) NOVEMBER 22, 2018

Gross Floor Area (m2) 3,135 Cost Per m2 3,060

				alifax			
				Elem	ental Cost		
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
	SHELL		C. C				
	. Sub-Structure						\$226,097
<b> </b> ^'		0.05	704	0	<b>#</b> 000 00	#000 007	\$226,097
١.,	A1.1 Foundations	0.25	784	m2	\$288.39	\$226,097	
AZ	. Structure						\$1,260,900
	A2.1 Lowest Floor Construction A2.2 Upper Floor Construction	0.25		m2	\$88.73	\$69,567	
	A2.3 Roof Construction	0.75 0.25	2,351 784	m2	\$397.78 \$326.74	\$935,170 \$256,163	
А3	Exterior Enclosure				+	<b>4</b> =23,133	\$1,019,026
	A3.2 Walls Above Grade	0.46	1,449	m2	\$517.91	\$750,454	
	A3.3 Windows & Entrances	0.40	-	m2	\$814.24	\$106,429	
	A3.4 Roof Finish	0.25		m2	\$173.93	\$136,364	
	A3.5 Projections	1.00	3,135	m2	\$8.22	\$25,778	
В.	INTERIORS						
В1	Partitions & Doors						\$912,710
	B1.1 Partitions	1.40	4,396	m2	\$163.12	\$717,130	
	B1.2 Doors	0.18	-	m2	\$355.06	\$195,580	
В2	Finishes						\$486,704
	B2.1 Floor Finishes	1.00	3,135	m2	\$82.44	\$258,450	
	B2.2 Ceiling Finishes	1.00	3,135	I	\$42.20	\$132,303	
	B2.3 Wall Finishes	2.13	6,669	m2	\$14.39	\$95,951	
ВЗ	Fittings & Equipment						\$621,372
	B3.1 Fittings & Fixtures	1.00	3,135	m2	\$112.40	\$352,380	
	B3.3 Conveying Systems	1.00	3,135	m2	\$85.80	\$268,992	
C.	SERVICES						
C1	Mechanical						\$1,376,908
	C1.1 Plumbing & Drainage	1.00	3,135	m2	\$209.36	\$656,341	
	C1.2 Fire Protection	1.00	3,135	m2	\$28.90	\$90,589	
	C1.3 Heating, Ventilation, Air Cond.	1.00	3,135	I	\$195.95	\$614,289	
l	C1.4 Controls	1.00	3,135	m2	\$5.00	\$15,689	
C2	Electrical						\$638,419
	C2.1 Service & Distribution	1.00	3,135		\$47.43	\$148,699	
	C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries	1.00 1.00	3,135 3,135		\$63.11 \$93.10	\$197,858 \$291,861	
L	SITE & ANCILLARY WORK	1.00	3,133	1112	ψ90.10	Ψ231,001	
	Site Work						\$60.447
ا'ا		4.00	0.40=		400.15	#00 41 <del>-</del>	\$69,447
L	D1.3 Electrical Site Services	1.00	3,135	m2	\$22.15	\$69,447	
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$1,008,720
	Z1.1 General Requirements	1.00	3,135		\$205.57	\$644,460	
	Z1.2 Fees	1.00	3,135	m2	\$116.19	\$364,260	
Z2	Allowances						\$1,972,795
	Z2.1 Design Allowance	1.00			\$483.09	\$1,514,481	
	Z2.2 Escalation Allowance Z2.3 Construction Allowance	1.00	3,135		Excluded	¢450.044	
	ZZ.O OOHSH GOROH AHOWAITE	1.00	3,135	IIIZ	\$146.19	\$458,314	
	Total	<u> </u>			\$284	per sf	\$9,593,000

#### **ELEMENTAL SUMMARY**

### CARBON COSTING STUDY - LOW RISE MURB 100% CARBON REDUCTION

A.W. HOOKER ® QUANTITY SURVEYORS

CLASS D ESTIMATE (Rev.1) NOVEMBER 22, 2018

Gross Floor Area (m2) 3,135 Cost Per m2 3,509

						ost Per m2	3,509
					Location :	Var	couver
				Elem	ental Cost		<b>-</b> :
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A.	SHELL						
Α1	. Sub-Structure						\$242,301
	A1.1 Foundations	0.25	784	m2	\$309.06	\$242,301	
Α2	. Structure						\$1,289,250
	A2.1 Lowest Floor Construction	0.25	784	m2	\$90.73	\$71,131	
	A2.2 Upper Floor Construction	0.75	,		\$406.72	\$956,196	
	A2.3 Roof Construction	0.25	784	m2	\$334.08	\$261,922	
А3	. Exterior Enclosure						\$1,165,390
İ	A3.2 Walls Above Grade	0.46	,		\$604.42		
	A3.3 Windows & Entrances A3.4 Roof Finish	0.04 0.25		m2 m2	\$832.55 \$196.94	\$108,822 \$154,404	
	A3.5 Projections	1.00			\$8.41	\$26,358	
В.	INTERIORS						
В1	Partitions & Doors						\$933,231
	B1.1 Partitions	1.40	4,396	m2	\$166.79	\$733,254	
İ	B1.2 Doors	0.18	,	m2	\$363.05	\$199,977	
В2	Finishes						\$537,570
	B2.1 Floor Finishes	1.00	3,135	m2	\$97.68	\$306,216	
İ	B2.2 Ceiling Finishes	1.00	3,135	m2	\$43.93	\$137,736	
	B2.3 Wall Finishes	2.13	6,669	m2	\$14.04	\$93,618	
ВЗ	Fittings & Equipment						\$635,342
	B3.1 Fittings & Fixtures	1.00	-,		\$114.93	\$360,302	
	B3.3 Conveying Systems	1.00	3,135	m2	\$87.73	\$275,040	
	SERVICES						
C1	Mechanical						\$1,915,490
	C1.1 Plumbing & Drainage C1.2 Fire Protection	1.00	,		\$245.80	\$770,577	
	C1.3 Heating, Ventilation, Air Cond.	1.00 1.00	,		\$28.43 \$298.33	\$89,125 \$935,273	
	C1.4 Controls	1.00	,		\$38.44	\$120,516	
C2	Electrical						\$769,447
İ	C2.1 Service & Distribution	1.00	3,135	m2	\$62.43	\$195,733	
	C2.2 Lighting, Devices & Heating	1.00	3,135	m2	\$93.01	\$291,572	
	C2.3 Systems & Ancillaries	1.00	3,135	m2	\$90.00	\$282,143	
D.	SITE & ANCILLARY WORK						
D1	Site Work						\$71,008
	D1.3 Electrical Site Services	0.20	627	m2	\$113.25	\$71,008	
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$1,163,286
	Z1.1 General Requirements	1.00	3,135	m2	\$237.03	\$743,086	
	Z1.2 Fees	1.00	3,135	m2	\$134.04	\$420,200	
Z2	Allowances						\$2,278,057
l	Z2.1 Design Allowance	1.00	3,135	m2	\$557.95	\$1,749,178	
	Z2.2 Escalation Allowance	1.00	,		Excluded		
_	Z2.3 Construction Allowance	1.00	3,135	m2	\$168.70	\$528,879	
L	Total				\$326	per sf	\$11,000,000

### CARBON COSTING STUDY - LOW RISE MURB 100% CARBON REDUCTION



CLASS D ESTIMATE (Rev.1) NOVEMBER 22, 2018

Gross Floor Area (m2) 3,135 Cost Per m2 3,693

					C	ost Per m2	3,693
					Location :	C	algary
				Elem	ental Cost		
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
	SHELL	Ratio	quantity	Offic	Ruto	Liement	Total
Δ1	. Sub-Structure						\$265,847
ľ.,	A1.1 Foundations	0.25	79.4	m2	\$339.09	\$265,847	\$200,047
۸2	Structure	0.23	704	1112	ψ559.09	Ψ203,047	£4 244 COO
A2		0.05	70.4	_	404.00	<b>AT4 405</b>	\$1,344,600
	A2.1 Lowest Floor Construction A2.2 Upper Floor Construction	0.25		m2	\$94.62	\$74,185	
	A2.3 Roof Construction	0.75 0.25	2,351	m2 m2	\$424.18 \$348.43	\$997,248 \$273,167	
۸3	Exterior Enclosure	0.23	704	1112	ψ540.43	Ψ213,101	\$4.24E.422
AS							\$1,215,422
	A3.2 Walls Above Grade A3.3 Windows & Entrances	0.46	1,449		\$630.37	\$913,405	
	A3.4 Roof Finish	0.04 0.25		m2 m2	\$868.29 \$205.40	\$113,494 \$161,033	
	A3.5 Projections	1.00	3,135		\$8.77	\$27,490	
В.	INTERIORS		,			, ,	
В1	Partitions & Doors						\$973,296
	B1.1 Partitions	1.40	4,396	m2	\$173.95	\$764,734	
	B1.2 Doors	0.18	· ·	m2	\$378.63	\$208,562	
B2	Finishes						\$562,602
	B2.1 Floor Finishes	1.00	3,135	m2	\$95.68	\$299,961	
	B2.2 Ceiling Finishes	1.00	3,135		\$48.90	\$153,301	
	B2.3 Wall Finishes	2.13	6,669		\$16.40	\$109,339	
вз	Fittings & Equipment						\$662,619
	B3.1 Fittings & Fixtures	1.00	3,135	m2	\$119.86	\$375,771	
	B3.3 Conveying Systems	1.00	3,135		\$91.50	\$286,848	
C.	SERVICES						
C1	Mechanical						\$2,047,665
	C1.1 Plumbing & Drainage	1.00	3,135	m2	\$262.76	\$823,749	
	C1.2 Fire Protection	1.00	3,135		\$30.39	\$95,275	
	C1.3 Heating, Ventilation, Air Cond.	1.00	3,135	m2	\$318.92	\$999,810	
	C1.4 Controls	1.00	3,135	m2	\$41.09	\$128,832	
C2	Electrical						\$842,117
	C2.1 Service & Distribution	1.00	3,135	m2	\$68.33	\$214,219	
	C2.2 Lighting, Devices & Heating	1.00	3,135		\$101.79	\$319,109	
L	C2.3 Systems & Ancillaries	1.00	3,135	m2	\$98.50	\$308,790	
	SITE & ANCILLARY WORK						
D1	Site Work						\$74,057
	D1.3 Electrical Site Services	0.20	627	m2	\$118.11	\$74,057	
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$1,213,228
	Z1.1 General Requirements	1.00	3,135		\$247.20	\$774,988	
	Z1.2 Fees	1.00	3,135	m2	\$139.79	\$438,240	
Z2	Allowances						\$2,375,858
	Z2.1 Design Allowance	1.00	3,135		\$581.91		
	Z2.2 Escalation Allowance	1.00	3,135		Excluded		
$\vdash$	Z2.3 Construction Allowance	1.00	3,135	m2	\$175.94		
	Total				\$343	per sf	\$11,577,000

#### **ELEMENTAL SUMMARY**

## CARBON COSTING STUDY - LOW RISE MURB 100% CARBON REDUCTION

A.W. HOOKER <sup>®</sup>
QUANTITY SURVEYORS

CLASS D ESTIMATE (Rev.1) NOVEMBER 22, 2018

Gross Floor Area (m2)	3,135
Cost Per m2	3,709

					Location :	To	pronto
Dag	anintian			Elem	ental Cost Unit	Sub	Flowers
	cription ment\Sub-Element	Ratio	Quantity	Unit	Rate	Element	Element Total
Α.	SHELL						
A1.	Sub-Structure						\$253,18
	A1.1 Foundations	0.25	784	m2	\$322.94	\$253,188	
Δ2	Structure				***	<b>4</b> =00,100	\$1,350,00
	A2.1 Lowest Floor Construction	0.25	784	m2	\$95.00	\$74,483	<b>\$1,000,00</b>
	A2.2 Upper Floor Construction	0.25	2,351		\$425.88	\$1,001,253	
	A2.3 Roof Construction	0.25	784		\$349.83	\$274,264	
A3.	Exterior Enclosure						\$1,220,30
	A3.2 Walls Above Grade	0.46	1,449	m2	\$632.90	\$917,073	
	A3.3 Windows & Entrances	0.04	131	m2	\$871.78	\$113,950	
	A3.4 Roof Finish	0.25	784	m2	\$206.22	\$161,680	
	A3.5 Projections	1.00	3,135	m2	\$8.80	\$27,600	
В.	INTERIORS						
В1	Partitions & Doors						\$977,20
	B1.1 Partitions	1.40	4,396	m2	\$174.65	\$767,805	
	B1.2 Doors	0.18	551	m2	\$380.15	\$209,400	
B2	Finishes						\$532,59
	B2.1 Floor Finishes	1.00	3,135	m2	\$90.69	\$284,324	
	B2.2 Ceiling Finishes	1.00	3,135	m2	\$46.84	\$146,840	
	B2.3 Wall Finishes	2.13	6,669	m2	\$15.21	\$101,428	
В3	Fittings & Equipment						\$665,28
	B3.1 Fittings & Fixtures	1.00	3,135		\$120.34	\$377,280	
	B3.3 Conveying Systems	1.00	3,135	m2	\$91.87	\$288,000	
C.	SERVICES						
C1	Mechanical						\$2,098,0°
	C1.1 Plumbing & Drainage	1.00	3,135	m2	\$269.22	\$844,005	
	C1.2 Fire Protection	1.00	3,135	m2	\$31.14	\$97,618	
	C1.3 Heating, Ventilation, Air Cond.	1.00	3,135		\$326.76	\$1,024,395	
	C1.4 Controls	1.00	3,135	m2	\$42.11	\$132,000	
C2	Electrical						\$854,9
	C2.1 Service & Distribution	1.00	3,135		\$69.37	\$217,481	
	C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries	1.00	3,135		\$103.34	\$323,969 \$313,492	
<b>D</b>	SITE & ANCILLARY WORK	1.00	3,135	mz	\$100.00	\$313,492	
	Site Work						¢74.2
יט	D1.3 Electrical Site Services	0.20	627	m2	\$118.59	\$74,354	\$74,3
,		0.20	027	1112	\$110.59	\$74,334	
۷.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$1,218,1
	Z1.1 General Requirements	1.00	3,135	m2	\$248.20	\$778,100	
	Z1.2 Fees	1.00	3,135		\$140.35	\$440,000	
Z2	Allowances						\$2,385,4
	Z2.1 Design Allowance	1.00	3,135	m2	\$584.24	\$1,831,600	
	Z2.2 Escalation Allowance	1.00	3,135	m2	Excluded		
	Z2.3 Construction Allowance	1.00	3,135	m2	\$176.65	\$553,800	
	Total				\$345	per sf	\$11,629,00

### CARBON COSTING STUDY - LOW RISE MURB 100% CARBON REDUCTION



CLASS D ESTIMATE (Rev.1) NOVEMBER 22, 2018

Gross Floor Area (m2) 3,135 Cost Per m2 3,626

					C	ost Per m2	3,626
					Location :	0	ttawa
				Elem	ental Cost		
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A.	SHELL						
A1.	. Sub-Structure						\$246,352
	A1.1 Foundations	0.25	784	m2	\$314.22	\$246,352	, ,,,,
1,2	. Structure	0.20	701		ψ011.ZZ	Ψ2 10,002	64 222 000
	A2.1 Lowest Floor Construction	0.05	70.4	_	400.40	470.004	\$1,323,000
	A2.1 Lowest Floor Construction A2.2 Upper Floor Construction	0.25		m2	\$93.10	\$72,994	
	A2.3 Roof Construction	0.75 0.25	2,351 784	m2 m2	\$417.37 \$342.83	\$981,228 \$268,779	
Δ3	Exterior Enclosure	0.20	701		ψ0 12:00	Ψ200,110	\$1,195,897
		0.40	4 440	_	#000 O.4	4000 700	\$1,133,037
	A3.2 Walls Above Grade A3.3 Windows & Entrances	0.46 0.04	1,449	m2 m2	\$620.24 \$854.34	\$898,732 \$111,671	
	A3.4 Roof Finish	0.04		m2	\$202.10	\$111,671	
	A3.5 Projections	1.00	3,135		\$8.63	\$27,048	
В.	INTERIORS						
В1	Partitions & Doors						\$957,661
	B1.1 Partitions	1.40	4,396	m2	\$171.15	\$752,449	<del>-</del>
	B1.2 Doors	0.18		m2	\$372.55	\$205,212	
R2	Finishes	0.10	00.		<b>40.2.00</b>	<b>4200,212</b>	\$506,646
_		4.00	0.405	0	<b>COC C4</b>	¢074 500	\$300,040
	B2.1 Floor Finishes B2.2 Ceiling Finishes	1.00 1.00	3,135 3,135		\$86.61 \$43.84	\$271,529 \$137,442	
	B2.3 Wall Finishes	2.13	6,669		\$14.65	\$137,442	
B3	Fittings & Equipment		5,000		*******	40.,0.0	\$651,974
ľ	•	4.00	0.405	0	£447.04	#200 <b>7</b> 04	Ψ031,374
	B3.1 Fittings & Fixtures B3.3 Conveying Systems	1.00 1.00	3,135 3,135		\$117.94 \$90.03	\$369,734 \$282,240	
	SERVICES	1.00	0,100	1112	ψ30.00	Ψ202,240	
	Mechanical						¢0 000 700
<b> </b>							\$2,028,783
	C1.1 Plumbing & Drainage	1.00	3,135		\$260.34		
	C1.2 Fire Protection C1.3 Heating, Ventilation, Air Cond.	1.00 1.00	3,135 3,135		\$30.11 \$315.98	\$94,396 \$990,590	
	C1.4 Controls	1.00	3,135		\$40.72	\$127,644	
C2	Electrical		,		·	. ,	\$854,087
-	C2.1 Service & Distribution	1.00	3,135	m2	\$69.30	\$217,263	400-1,001
	C2.2 Lighting, Devices & Heating	1.00	3,135		\$103.24	\$323,645	
	C2.3 Systems & Ancillaries	1.00	3,135		\$99.90		
D.	SITE & ANCILLARY WORK						
D1	Site Work						\$72,867
	D1.3 Electrical Site Services	0.20	627	m2	\$116.22	\$72,867	Ţ. <u>_</u> ,301
,	GENERAL REQUIREMENTS	0.20	021	1112	Ψ110.22	Ψ12,001	
	& ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$1,193,738
	Z1.1 General Requirements	1.00	3,135	m2	\$243.23	\$762,538	
	Z1.2 Fees	1.00	3,135	m2	\$137.54	\$431,200	
Z2	Allowances						\$2,337,692
	Z2.1 Design Allowance	1.00	3,135	m2	\$572.56	\$1,794,968	
	Z2.2 Escalation Allowance	1.00	3,135		Excluded		
L	Z2.3 Construction Allowance	1.00	3,135	m2	\$173.12	\$542,724	
	Total				\$337	per sf	\$11,369,000
		I			4501	r	

#### **ELEMENTAL SUMMARY**

## CARBON COSTING STUDY - LOW RISE MURB 100% CARBON REDUCTION



CLASS D ESTIMATE (Rev.1) NOVEMBER 22, 2018

Gross Floor Area (m2)	3,135
Cost Per m2	3,529

A1. : A1. : A2. : A2. : A3. :	cription nent\Sub-Element SHELL Sub-Structure A1.1 Foundations Structure	Ratio	Quantity	Elem Unit	Location : ental Cost Unit Rate	Sub Element	entreal  Element  Total
A1. : A1. : A2. : A2. : A3. :	nent\Sub-Element SHELL Sub-Structure A1.1 Foundations		Quantity		Unit		
A1. : A1. : A2. : A2. : A3. :	nent\Sub-Element SHELL Sub-Structure A1.1 Foundations		Quantity	Unit			
A. :	SHELL Sub-Structure A1.1 Foundations		Quantity	Cilic	Rate	Licilicit	
A1.	Sub-Structure A1.1 Foundations	0.25					Total
A2. ;	A1.1 Foundations	0.25					\$246.252
A2. ; A3.			704	0	#244.00	#04C 0F0	\$246,352
A3. I	Structure	0.20	784	m2	\$314.22	\$246,352	
A3.							\$1,291,950
A3.	A2.1 Lowest Floor Construction	0.25		m2	\$90.92	\$71,280	
<b>A3.</b>	A2.2 Upper Floor Construction A2.3 Roof Construction	0.75 0.25	2,351	m2 m2	\$407.57 \$334.78	\$958,199 \$262,471	
,	Exterior Enclosure	0.23	704	1112	ψ334.70	Ψ202, <del>4</del> 71	\$1,167,830
,	A3.2 Walls Above Grade	0.46	1,449	m2	\$605.69	\$877,639	<b>\$1,101,000</b>
,	A3.3 Windows & Entrances	0.40		m2	\$834.29	\$109,050	
	A3.4 Roof Finish	0.25		m2	\$197.36	\$154,728	
	A3.5 Projections	1.00	3,135	m2	\$8.43	\$26,413	
В.	INTERIORS						
В1	Partitions & Doors						\$935,185
ı	B1.1 Partitions	1.40	4,396	m2	\$167.14	\$734,790	
ı	B1.2 Doors	0.18	551	m2	\$363.81	\$200,396	
B2	Finishes						\$533,246
ı	32.1 Floor Finishes	1.00	3,135	m2	\$91.60	\$287,167	
ı	32.2 Ceiling Finishes	1.00	3,135	m2	\$46.46	\$145,665	
ı	32.3 Wall Finishes	2.13	6,669	m2	\$15.06	\$100,414	
ВЗ	Fittings & Equipment						\$636,673
ı	B3.1 Fittings & Fixtures	1.00	3,135	m2	\$115.17	\$361,057	
ı	33.3 Conveying Systems	1.00	3,135	m2	\$87.92	\$275,616	
C.	SERVICES						
C1	Mechanical						\$1,944,862
(	C1.1 Plumbing & Drainage	1.00	3,135	m2	\$249.57	\$782,393	
	C1.2 Fire Protection	1.00	3,135	m2	\$28.86	\$90,491	
	C1.3 Heating, Ventilation, Air Cond.	1.00	3,135		\$302.91	\$949,614	
	C1.4 Controls	1.00	3,135	m2	\$39.03	\$122,364	<b>^</b>
	Electrical						\$786,546
	C2.1 Service & Distribution	1.00	3,135		\$63.82	\$200,082	
	C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries	1.00 1.00	3,135 3,135		\$95.07 \$92.00	\$298,051 \$288,413	
	SITE & ANCILLARY WORK	1.00	3,133	1112	ψ32.00	Ψ200,410	
	Site Work						\$71,157
	D1.3 Electrical Site Services	0.20	627	m2	\$113.49	\$71,157	, ,
7.	GENERAL REQUIREMENTS				,	, ,	
	& ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$1,165,722
:	Z1.1 General Requirements	1.00	3,135	m2	\$237.53	\$744,642	
	Z1.2 Fees	1.00	3,135	m2	\$134.32	\$421,080	
<b>Z</b> 2	Allowances						\$2,282,828
	Z2.1 Design Allowance	1.00	3,135	m2	\$559.12	\$1,752,841	
	Z2.2 Escalation Allowance	1.00	3,135		Excluded		
-	Z2.3 Construction Allowance	1.00	3,135	m2	\$169.05	\$529,987	
•	Total				\$328	per sf	\$11,062,000

#### **ELEMENTAL SUMMARY CARBON COSTING STUDY - LOW RISE**

**MURB 100% CARBON REDUCTION** 

HOOKER ®

CLASS D ESTIMATE (Rev.1) NOVEMBER 22, 2018

Gross Floor Area (m2) 3,135

Description Element\Sub-Element  A. SHELL  A1. Sub-Structure     A1.1 Foundations  A2. Structure     A2.1 Lowest Floor Constr     A2.2 Upper Floor Constr     A2.3 Roof Construction  A3. Exterior Enclosure     A3.2 Walls Above Grade     A3.3 Windows & Entrant		Ratio	Quantity		Location : ental Cost Unit	H Sub	alifax
A. SHELL A1. Sub-Structure A1.1 Foundations A2. Structure A2.1 Lowest Floor Constructure A2.2 Upper Floor Construction A3. Exterior Enclosure A3.2 Walls Above Grade		Ratio	Quantity			Sub	Element
A. SHELL A1. Sub-Structure A1.1 Foundations A2. Structure A2.1 Lowest Floor Constructure A2.2 Upper Floor Construction A3. Exterior Enclosure A3.2 Walls Above Grade		Ratio	Quantity		Unit	Sub	
A1. Sub-Structure A1.1 Foundations  A2. Structure A2.1 Lowest Floor Constr A2.2 Upper Floor Constr A2.3 Roof Construction  A3. Exterior Enclosure A3.2 Walls Above Grade				Unit	Rate	Element	Element Total
A1.1 Foundations  A2. Structure  A2.1 Lowest Floor Construction A2.2 Upper Floor Construction A3. Exterior Enclosure  A3.2 Walls Above Grade	- 1						
A2. Structure  A2.1 Lowest Floor Construction A2.2 Upper Floor Construction A3. Exterior Enclosure A3.2 Walls Above Grade							\$226,097
A2.1 Lowest Floor Const A2.2 Upper Floor Constr A2.3 Roof Construction A3. Exterior Enclosure A3.2 Walls Above Grade		0.25	784	m2	\$288.39	\$226,097	<b>V</b> ==0,00
A2.1 Lowest Floor Const A2.2 Upper Floor Constr A2.3 Roof Construction A3. Exterior Enclosure A3.2 Walls Above Grade	- 1	0.20			<b>\$200.00</b>	<b>\$220,00</b> 1	\$1,260,900
A2.2 Upper Floor Constr A2.3 Roof Construction A3. Exterior Enclosure A3.2 Walls Above Grade	ruction	0.25	784	m2	\$88.73	\$69,567	ψ1,200,300
A2.3 Roof Construction  A3. Exterior Enclosure  A3.2 Walls Above Grade		0.25	2,351		\$397.78	\$935,170	
A3.2 Walls Above Grade		0.25	784		\$326.74	\$256,163	
							\$1,139,76
A3.3 Windows & Entrang	•	0.46	1,449	m2	\$591.13	\$856,546	
710.0 Trindotto a Entidin	ces	0.04	131	m2	\$814.24	\$106,429	
A3.4 Roof Finish		0.25	784		\$192.61	\$151,009	
A3.5 Projections		1.00	3,135	m2	\$8.22	\$25,778	
B. INTERIORS							
B1 Partitions & Doors							\$912,710
B1.1 Partitions		1.40	4,396		\$163.12	\$717,130	
B1.2 Doors	L	0.18	551	m2	\$355.06	\$195,580	
B2 Finishes							\$486,704
B2.1 Floor Finishes		1.00	3,135		\$82.44	\$258,450	
B2.2 Ceiling Finishes B2.3 Wall Finishes		1.00 2.13	3,135		\$42.20	\$132,303	
		2.13	6,669	m2	\$14.39	\$95,951	****
B3 Fittings & Equipmen	١						\$621,372
B3.1 Fittings & Fixtures		1.00	3,135		\$112.40	\$352,380	
B3.3 Conveying Systems		1.00	3,135	mz	\$85.80	\$268,992	
C. SERVICES							
C1 Mechanical							\$1,946,960
C1.1 Plumbing & Draina	ge	1.00	3,135		\$249.84	\$783,237	
C1.2 Fire Protection C1.3 Heating, Ventilation	Air Cond	1.00 1.00	3,135 3,135		\$28.90 \$303.23	\$90,589 \$950,639	
C1.4 Controls	1, 7111 Ooria.	1.00	3,135		\$39.07	\$122,496	
C2 Electrical	- 1		.,		, , , ,	, , , , ,	\$795,951
C2.1 Service & Distributi	on	1.00	3,135	m2	\$64.59	\$202,475	<del></del>
C2.2 Lighting, Devices 8		1.00	3,135		\$96.21	\$301,615	
C2.3 Systems & Ancillar	ies	1.00	3,135	m2	\$93.10	\$291,861	
D. SITE & ANCILLARY	/ WORK						
D1 Site Work							\$69,447
D1.3 Electrical Site Serv	ices	0.20	627	m2	\$110.76	\$69,447	
Z. GENERAL REQUIR & ALLOWANCES	EMENTS						
Z1 General Requiremen	ts & Fees						\$1,137,705
Z1.1 General Requireme	ents	1.00	3,135	m2	\$231.82	\$726,745	
Z1.2 Fees		1.00	3,135		\$131.09	\$410,960	
Z2 Allowances							\$2,227,964
Z2.1 Design Allowance		1.00	3,135	m2	\$545.68	\$1,710,714	
Z2.2 Escalation Allowan		1.00	3,135		Excluded		
Z2.3 Construction Allowa	ance	1.00	3,135	m2	\$164.99	\$517,249	
Total					\$321	per sf	\$10,826,000

#### **ELEMENTAL SUMMARY CARBON COSTING STUDY - GENERIC** STAND ALONE RETAIL BASE BUILDING



\$1,110,665

\$5,345,000

CLASS D ESTIMATE (Rev.3)

NOVEMBER 22, 2018 Gross Floor Area (m2) 2,294 Cost Per m2 2,330 Location: Vancouver **Elemental Cost** Description Unit Sub Element A. SHELL A1. Sub-Structure \$286,537 A1.1 Foundations \$286.537 2.294 m2 \$124.91 A2. Structure \$834,512 A2.1 Lowest Floor Construction 2,294 m2 \$136.69 \$313,573 A2.3 Roof Construction 1.00 2,294 m2 \$227.09 \$520,939 A3. Exterior Enclosure \$1,029,314 A3.2 Walls Above Grade 0.51 1,177 m2 \$434.51 \$511.303 A3.3 Windows & Entrances 0.05 114 m2 \$247.96 \$28,268 A3.4 Roof Finish 1.00 2,294 m2 \$186.87 \$428,680 A3.5 Projections 1.00 2,294 m2 \$26.62 \$61,063 B. INTERIORS **B1 Partitions & Doors** \$225,692 **B1.1 Partitions** \$172,690 1,275 m2 \$135.44 B1.2 Doors 0.02 \$981.53 \$53,003 54 m2 B2 Finishes \$222,573 **B2.1 Floor Finishes** 1.00 2,294 m2 \$47.54 \$109,068 **B2.2 Ceiling Finishes** 2,294 m2 \$89,720 1.00 \$39.11 B2.3 Wall Finishes 0.51 1,177 m2 \$20.21 \$23,786 **B3 Fittings & Equipment** \$132,928 B3.1 Fittings & Fixtures 2,294 m2 1.00 \$51.70 \$118,603 B3.2 Equipment \$14,325 1.00 2,294 m2 \$6.24 C. SERVICES C1 Mechanical \$499,407 C1.1 Plumbing & Drainage \$133,559 2,294 m2 \$58.22 C1.2 Fire Protection 1.00 2,294 m2 \$18.86 \$43,258 C1.3 Heating, Ventilation, Air Cond. 1.00 2,294 m2 \$137.24 \$314,829 C1.4 Controls 1.00 2,294 m2 \$3.38 \$7,761 C2 Electrical \$416,213 C2.1 Service & Distribution 1.00 2,294 m2 \$39.05 \$89,588 C2.2 Lighting, Devices & Heating \$235,737 1.00 2,294 m2 \$102.76 C2.3 Systems & Ancillaries 1.00 2,294 m2 \$39.62 \$90,888 D. SITE & ANCILLARY WORK D1 Site Work \$23,639 D1.3 Electrical Site Services 1.00 2,294 m2 \$10.30 \$23,639 GENERAL REQUIREMENTS & ALLOWANCES Z1 General Requirements & Fees \$563,164 Z1.1 General Requirements 2,294 m2 \$156.82 \$359,749 Z1.2 Fees 2,294 m2 1.00 \$88.67 \$203,415

2,294 m2

2,294 m2

2,294 m2

1.00

1.00

1.00

\$372.43

\$111.74

\$216 per sf

Excluded

\$854,343

\$256,322

A.W. HOOKER ASSOCIATES LTD. PROJECT NO:116065 PAGE C1 PAGE C1 A.W. HOOKER ASSOCIATES LTD. PROJECT NO:116065

**Z2** Allowances

Total

Z2.1 Design Allowance

Z2.2 Escalation Allowance

Z2.3 Construction Allowance

#### **ELEMENTAL SUMMARY CARBON COSTING STUDY - GENERIC** STAND ALONE RETAIL BASE BUILDING



CLASS D ESTIMATE (Rev.3) NOVEMBER 22, 2018

Gross Floor Area (m2) 2,294

						ost Per m2	2,452
					Location:	C	algary
				Elem	ental Cost		
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A.	SHELL						
A1	. Sub-Structure						\$314,383
	A1.1 Foundations	1.00	2,294	m2	\$137.05	\$314,383	
A2	. Structure						\$870,339
	A2.1 Lowest Floor Construction	1.00	2,294	m2	\$142.56	\$327,036	
	A2.3 Roof Construction	1.00	2,294	I	\$236.84	\$543,304	
А3	. Exterior Enclosure						\$1,073,505
	A3.2 Walls Above Grade	0.51	1,177	m2	\$453.16	\$533,254	
	A3.3 Windows & Entrances	0.05	,	m2	\$258.61	\$29,482	
	A3.4 Roof Finish	1.00	2,294		\$194.89	\$447,084	
	A3.5 Projections	1.00	2,294		\$27.76		
В.	INTERIORS						
В1	Partitions & Doors						\$235,382
	B1.1 Partitions	0.56	1,275	m2	\$141.26	\$180,104	
	B1.2 Doors	0.02	,	m2	\$1,023.67	\$55,278	
B2	Finishes						\$234,479
	B2.1 Floor Finishes	1.00	2,294	m2	\$46.57	\$106,840	
	B2.2 Ceiling Finishes	1.00	2,294		\$43.53	,	
	B2.3 Wall Finishes	0.51	1,177	I	\$23.60	\$27,780	
В3	Fittings & Equipment		,		, , ,	, , , , ,	\$138,635
	B3.1 Fittings & Fixtures	1.00	2,294	m2	\$53.92	\$123,695	
	B3.2 Equipment	1.00	2,294		\$6.51	\$14,940	
c.	SERVICES						
C1	Mechanical						\$533,868
	C1.1 Plumbing & Drainage	1.00	2,294	m2	\$62.24	\$142,775	
	C1.2 Fire Protection	1.00	2,294		\$20.16		
	C1.3 Heating, Ventilation, Air Cond.	1.00	2,294		\$146.71	\$336,554	
	C1.4 Controls	1.00	2,294	m2	\$3.62	\$8,296	
C2	Electrical						\$455,522
	C2.1 Service & Distribution	1.00	2,294	m2	\$42.74	\$98,049	
	C2.2 Lighting, Devices & Heating	1.00	2,294		\$112.47	\$258,001	
	C2.3 Systems & Ancillaries	1.00	2,294	m2	\$43.36	\$99,472	
D.	SITE & ANCILLARY WORK						
D1	Site Work						\$24,654
	D1.3 Electrical Site Services	1.00	2,294	m2	\$10.75	\$24,654	
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$587,341
	Z1.1 General Requirements	1.00	2,294	I	\$163.55		
	Z1.2 Fees	1.00	2,294	m2	\$92.48	\$212,148	
Z2	Allowances						\$1,158,348
	Z2.1 Design Allowance	1.00	2,294		\$388.41		
	Z2.2 Escalation Allowance Z2.3 Construction Allowance	1.00 1.00	2,294 2,294		Excluded \$116.53		
	Total		<u> </u>	L		per sf	\$5,626,000
	ı otal				<b>Ψ</b> 440	hei si	₩3,020,000

#### **ELEMENTAL SUMMARY CARBON COSTING STUDY - GENERIC** STAND ALONE RETAIL BASE BUILDING



\$5,636,000

\$228 per sf

CLASS D ESTIMATE (Rev.3)

NOVEMBER 22, 2018 Gross Floor Area (m2) 2,294 Cost Per m2 2,457 Location: Toronto **Elemental Cost** Description Unit Sub Element A. SHELL A1. Sub-Structure \$299,412 A1.1 Foundations \$299,412 2.294 m2 \$130.52 A2. Structure \$873,835 A2 1 Lowest Floor Construction 2,294 m2 \$143.13 \$328,349 A2.3 Roof Construction 1.00 2,294 m2 \$237.79 \$545,486 A3. Exterior Enclosure \$1,077,816 A3.2 Walls Above Grade 0.51 1,177 m2 \$454.98 \$535.396 A3.3 Windows & Entrances 0.05 114 m2 \$259.65 \$29,600 A3.4 Roof Finish 1.00 2,294 m2 \$195.68 \$448,880 A3.5 Projections 1.00 2,294 m2 \$27.87 \$63,940 B. INTERIORS **B1 Partitions & Doors** \$236,327 **B1.1 Partitions** \$180,827 1,275 m2 \$141.83 B1.2 Doors 0.02 \$55,500 54 m2 \$1,027.78 B2 Finishes \$222,690 **B2.1 Floor Finishes** 1.00 2,294 m2 \$44.15 \$101,270 **B2.2 Ceiling Finishes** 2,294 m2 \$41.70 \$95,650 1.00 B2.3 Wall Finishes 0.51 1,177 m2 \$21.89 \$25,770 **B3 Fittings & Equipment** \$139,192 B3.1 Fittings & Fixtures 2,294 m2 1.00 \$54.14 \$124,192 B3.2 Equipment \$15,000 1.00 2,294 m2 \$6.54 C. SERVICES C1 Mechanical \$546,996 C1.1 Plumbing & Drainage \$146,286 2,294 m2 \$63.77 C1.2 Fire Protection 1.00 2,294 m2 \$20.65 \$47,380 C1.3 Heating, Ventilation, Air Cond. 1.00 2,294 m2 \$150.32 \$344,830 C1.4 Controls 1.00 2,294 m2 \$3.71 \$8,500 C2 Electrical \$462,459 C2.1 Service & Distribution 1.00 2,294 m2 \$43.39 \$99,542 C2.2 Lighting, Devices & Heating \$261,930 1.00 2,294 m2 \$114.18 C2.3 Systems & Ancillaries 1.00 2,294 m2 \$44.02 \$100,986 D. SITE & ANCILLARY WORK D1 Site Work \$24,753 D1.3 Electrical Site Services 1.00 2,294 m2 \$10.79 \$24,753 GENERAL REQUIREMENTS & ALLOWANCES Z1 General Requirements & Fees \$589,700 Z1.1 General Requirements 2,294 m2 \$164.21 \$376,700 Z1.2 Fees 1.00 2,294 m2 \$92.85 \$213,000 **Z2** Allowances \$1,163,000 Z2.1 Design Allowance 2,294 m2 \$389.97 \$894,600 1.00 Z2.2 Escalation Allowance 2,294 m2 Excluded 1.00 Z2.3 Construction Allowance 1.00 2,294 m2 \$117.00 \$268,400

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Total

#### **ELEMENTAL SUMMARY CARBON COSTING STUDY - GENERIC** STAND ALONE RETAIL BASE BUILDING



CLASS D ESTIMATE (Rev.3) NOVEMBER 22, 2018

Gross Floor Area (m2) Cost Per m2 2,294

					С	ost Per m2	2,405
					Location :	0	ttawa
				Elem	ental Cost		
	cription nent\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A.	SHELL						
A1.	Sub-Structure						\$291,328
	A1.1 Foundations	1.00	2,294	m2	\$127.00	\$291,328	
A2.	Structure		, -		,	, , , , ,	\$856,358
	A2.1 Lowest Floor Construction	1.00	2,294	m2	\$140.27	\$321,782	
	A2.3 Roof Construction	1.00	2,294		\$233.03	\$521,762 \$534,576	
A3.	Exterior Enclosure						\$1,056,259
	A3.2 Walls Above Grade	0.51	1,177	m2	\$445.88	\$524,688	
	A3.3 Windows & Entrances	0.05		m2	\$254.46	\$29,008	
	A3.4 Roof Finish	1.00	2,294	l	\$191.76	\$439,902	
	A3.5 Projections	1.00	2,294		\$27.32	\$62,661	
В.	INTERIORS						
В1	Partitions & Doors						\$231,600
	B1.1 Partitions	0.56	1,275	m2	\$138.99	\$177,210	
	B1.2 Doors	0.02	*	m2	\$1,007.22	\$54,390	
B2	Finishes						\$211,058
	B2.1 Floor Finishes	1.00	2,294	m2	\$42.16	\$96,713	
	B2.2 Ceiling Finishes	1.00	2,294		\$39.03	\$89,528	
	B2.3 Wall Finishes	0.51	1,177		\$21.08	\$24,817	
вз	Fittings & Equipment						\$136,408
	B3.1 Fittings & Fixtures	1.00	2,294	m2	\$53.05	\$121,708	
	B3.2 Equipment	1.00	2,294		\$6.41	\$14,700	
C.	SERVICES						
C1	Mechanical						\$528,945
	C1.1 Plumbing & Drainage	1.00	2,294	m2	\$61.66	\$141,459	
	C1.2 Fire Protection	1.00	2,294	l	\$19.97	\$45,816	
	C1.3 Heating, Ventilation, Air Cond.	1.00	2,294		\$145.36	\$333,450	
	C1.4 Controls	1.00	2,294	m2	\$3.58	\$8,220	
C2	Electrical						\$461,996
	C2.1 Service & Distribution	1.00	2,294	m2	\$43.35	\$99,443	
	C2.2 Lighting, Devices & Heating	1.00	2,294	m2	\$114.07	\$261,668	
	C2.3 Systems & Ancillaries	1.00	2,294	m2	\$43.98	\$100,885	
D.	SITE & ANCILLARY WORK						
D1	Site Work						\$24,258
	D1.3 Electrical Site Services	1.00	2,294	m2	\$10.57	\$24,258	
	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$577,906
	Z1.1 General Requirements	1.00	2,294	m2	\$160.93	\$369,166	
	Z1.2 Fees	1.00	2,294		\$90.99	\$208,740	
Z2	Allowances						\$1,139,740
	Z2.1 Design Allowance	1.00	2,294	m2	\$382.17	\$876,708	
	Z2.2 Escalation Allowance	1.00	2,294	m2	Excluded		
	Z2.3 Construction Allowance	1.00	2,294	m2	\$114.66	\$263,032	
	Total				\$223	per sf	\$5,516,000

#### **ELEMENTAL SUMMARY CARBON COSTING STUDY - GENERIC** STAND ALONE RETAIL BASE BUILDING



CLASS D ESTIMATE (Rev.3) NOVEMBER 22, 2018

Gross Floor Area (m2) 2,294 Cost Per m2 2,343 Location: Montreal **Elemental Cost** Description Unit

	ientioub-Element	Natio	Qualitity	UIIIL	Nate	Element	Total
Α. :	SHELL						
A1.	Sub-Structure						\$291,328
,	A1.1 Foundations	1.00	2,294	m2	\$127.00	\$291,328	
A2.	Structure						\$836,260
,	A2.1 Lowest Floor Construction	1.00	2,294	m2	\$136.98	\$314,230	. ,
	A2.3 Roof Construction	1.00	, -		\$227.56	\$522,030	
A3. I	Exterior Enclosure						\$1,031,47
,	A3.2 Walls Above Grade	0.51	1,177	m2	\$435.42	\$512,374	
,	A3.3 Windows & Entrances	0.05		m2	\$248.48	\$28,327	
	A3.4 Roof Finish	1.00	2,294	m2	\$187.26	\$429,578	
,	A3.5 Projections	1.00	2,294	m2	\$26.67	\$61,191	
<b>B</b> . I	INTERIORS						
B1 I	Partitions & Doors						\$226,16
	B1.1 Partitions	0.56	1,275	m2	\$135.73	\$173,051	
E	B1.2 Doors	0.02	54	m2	\$983.58	\$53,114	
B2 I	Finishes						\$222,68
	B2.1 Floor Finishes	1.00	2,294	m2	\$44.59	\$102,283	
	B2.2 Ceiling Finishes	1.00			\$41.36	\$94,885	
E	B2.3 Wall Finishes	0.51	1,177	m2	\$21.68	\$25,512	
В3 І	Fittings & Equipment						\$133,20
	B3.1 Fittings & Fixtures	1.00	2,294	m2	\$51.81	\$118,852	
	B3.2 Equipment	1.00	2,294	m2	\$6.26	\$14,355	
C. :	SERVICES						
C1 I	Mechanical						\$507,06
(	C1.1 Plumbing & Drainage	1.00	2,294	m2	\$59.11	\$135,607	
	C1.2 Fire Protection	1.00		l	\$19.15	\$43,921	
	C1.3 Heating, Ventilation, Air Cond. C1.4 Controls	1.00	· ·	l	\$139.34	\$319,657	
		1.00	2,294	m2	\$3.43	\$7,880	
	Electrical						\$425,46
	C2.1 Service & Distribution	1.00	· ·	l	\$39.92	\$91,579	
	C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries	1.00 1.00		l	\$105.05 \$40.50	\$240,975 \$92,908	
	SITE & ANCILLARY WORK	1.00	2,254	2	ψ+0.00	ψ32,300	
	Site Work						¢22.60
	D1.3 Electrical Site Services	1.00	2 204	O	¢40.22	¢22.690	\$23,68
	GENERAL REQUIREMENTS	1.00	2,294	IIIZ	\$10.33	\$23,689	
	& ALLOWANCES						
	General Requirements & Fees						\$564,34
	Z1.1 General Requirements	1.00	2,294	m2	\$157.15	\$360,502	<del>400 ije i</del>
	Z1.2 Fees	1.00			\$88.86	\$203,841	
Z2 /	Allowances		,			,	\$1,112,99
	Z2.1 Design Allowance	1.00	2,294	m2	\$373.20	\$856,132	,,
	Z2.2 Escalation Allowance	1.00		l	Excluded	ψοσο, 102	
	Z2.3 Construction Allowance	1.00			\$111.97	\$256,859	
	Total		!		****************	per sf	\$5,375,00

A.W. HOOKER ASSOCIATES LTD. PROJECT NO:116065 PAGE C1 A.W. HOOKER ASSOCIATES LTD. PAGE C1 PROJECT NO:116065

## ELEMENTAL SUMMARY CARBON COSTING STUDY - GENERIC STAND ALONE RETAIL BASE BUILDING



CLASS D ESTIMATE (Rev.3) NOVEMBER 22, 2018

Gross Floor Area (m2) 2,294 Cost Per m2 2,285

					ost Per m2	2,285
				Location :	i	alifax
			Elem	ental Cost		
Description Element\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A. SHELL						
A1. Sub-Structure						\$267,375
A1.1 Foundations	1.00	2,294	m2	\$116.55	\$267,375	
A2. Structure		_,		*******	<del>*==**</del> ,****	\$816,162
A2.1 Lowest Floor Construction	1.00	2,294	m2	\$133.69	\$306,678	4010,102
A2.3 Roof Construction	1.00	,	1	\$222.09	\$500,076 \$509,484	
A3. Exterior Enclosure						\$1,006,680
A3.2 Walls Above Grade	0.51	1,177	m2	\$424.95	\$500,060	
A3.3 Windows & Entrances	0.05	114	m2	\$242.51	\$27,646	
A3.4 Roof Finish	1.00	,	1	\$182.76		
A3.5 Projections	1.00	2,294	m2	\$26.03	\$59,720	
B. INTERIORS						****
B1 Partitions & Doors						\$220,729
B1.1 Partitions B1.2 Doors	0.56 0.02	,	m2 m2	\$132.46 \$959.94	\$168,892 \$51,837	
B2 Finishes	0.02	34	IIIZ	φ909.94	φ51,657	\$202,614
B2.1 Floor Finishes	1.00	2,294	m2	\$40.13	\$92,054	Ψ202,014
B2.2 Ceiling Finishes	1.00	2,294	1	\$40.13 \$37.57	\$92,034 \$86,181	
B2.3 Wall Finishes	0.51	1,177		\$20.71	\$24,378	
B3 Fittings & Equipment						\$130,005
B3.1 Fittings & Fixtures	1.00	2,294	m2	\$50.56	\$115,995	
B3.2 Equipment	1.00	2,294	m2	\$6.11	\$14,010	
C. SERVICES						
C1 Mechanical						\$507,612
C1.1 Plumbing & Drainage	1.00	2,294	m2	\$59.18	\$135,753	
C1.2 Fire Protection	1.00	,	1	\$19.17		
C1.3 Heating, Ventilation, Air Cond. C1.4 Controls	1.00	,	1	\$139.50	\$320,002	
C2 Electrical	1.00	2,294	IIIZ	\$3.44	\$7,888	\$430,549
C2.1 Service & Distribution	4.00	0.004		040.40	000.074	\$43U,548
C2.1 Service & Distribution C2.2 Lighting, Devices & Heating	1.00 1.00	,	1	\$40.40 \$106.30	\$92,674 \$243,857	
C2.3 Systems & Ancillaries	1.00	,		\$40.98	\$94,018	
D. SITE & ANCILLARY WORK						
D1 Site Work						\$23,119
D1.3 Electrical Site Services	1.00	2,294	m2	\$10.08	\$23,119	
Z. GENERAL REQUIREMENTS & ALLOWANCES						
Z1 General Requirements & Fees						\$550,780
Z1.1 General Requirements	1.00	2,294	m2	\$153.37	\$351,838	
Z1.2 Fees	1.00	2,294	m2	\$86.72	\$198,942	
Z2 Allowances						\$1,086,242
Z2.1 Design Allowance	1.00		1	\$364.24		
Z2.2 Escalation Allowance Z2.3 Construction Allowance	1.00	,	1	Excluded \$100.28		
	1.00	2,294	IIIZ	\$109.28		
Total				\$212	per sf	\$5,242,000

# ELEMENTAL SUMMARY CARBON COSTING STUDY - GENERIC STAND ALONE RETAIL 100% CARBON REDUCTION



CLASS D ESTIMATE (Rev.1)

	OVEMBER 22, 2018				2,294		
						ost Per m2	3,221
				Пана	Location :	Van	couver
Des	scription			Elem	ental Cost Unit	Sub	Element
	ment\Sub-Element	Ratio	Quantity	Unit		Element	Total
A.	SHELL						
Α1	. Sub-Structure						\$286,537
	A1.1 Foundations	1.00	2,294	m2	\$124.91	\$286,537	
Α2	. Structure						\$834,512
	A2.1 Lowest Floor Construction	1.00	2,294	m2	\$136.69	\$313,573	
	A2.3 Roof Construction	1.00	2,294	m2	\$227.09	\$520,939	
А3	. Exterior Enclosure						\$1,192,223
	A3.2 Walls Above Grade	0.51	1,177	m2	\$507.83	\$597,716	
	A3.3 Windows & Entrances	0.01		m2	\$974.76	\$28,268	
	A3.4 Roof Finish A3.5 Projections	1.00	2,294		\$220.22	\$505,176	
L	•	1.00	2,294	1112	\$26.62	\$61,063	
	INTERIORS						
B1	Partitions & Doors						\$225,692
	B1.1 Partitions B1.2 Doors	0.56 0.02	1,275	m2 m2	\$135.44 \$981.53	\$172,690	
D 2		0.02	54	mz	\$961.53	\$53,003	4000 570
B2	Finishes						\$222,573
	B2.1 Floor Finishes	1.00	2,294		\$47.54	\$109,068	
	B2.2 Ceiling Finishes B2.3 Wall Finishes	1.00 0.51	2,294 1,177		\$39.11 \$20.21	\$89,720 \$23,786	
B3	Fittings & Equipment	0.01	1,177		Ψ20.21	Ψ20,700	\$132,928
ľ	B3.1 Fittings & Fixtures	1.00	2,294	m2	¢51.70	¢110 602	ψ102,020
	B3.2 Equipment	1.00	2,294		\$51.70 \$6.24	\$118,603 \$14,325	
c.	SERVICES		_,		,,,,,	* : :,===	
	Mechanical						\$1,494,164
ľ	C1.1 Plumbing & Drainage	4.00	0.004	0	¢50.40	¢400.470	\$1,494,104
	C1.2 Fire Protection	1.00 1.00	2,294 2,294		\$58.19 \$18.86	\$133,479 \$43,258	
	C1.3 Heating, Ventilation, Air Cond.	1.00	2,294		\$512.13	\$1,174,816	
	C1.4 Controls	1.00	2,294	m2	\$62.17	\$142,611	
C2	Electrical						\$649,647
	C2.1 Service & Distribution	1.00	2,294	m2	\$48.46	\$111,166	
	C2.2 Lighting, Devices & Heating	1.00	2,294		\$195.11	\$447,593	
	C2.3 Systems & Ancillaries	1.00	2,294	m2	\$39.62	\$90,888	
	SITE & ANCILLARY WORK						
D1	Site Work						\$23,639
	D1.3 Electrical Site Services	0.20	460	m2	\$51.39	\$23,639	
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$783,291
	Z1.1 General Requirements	1.00	2,294	m2	\$218.23	\$500,611	
	Z1.2 Fees	1.00	2,294	m2	\$123.23	\$282,680	
Z2	Allowances						\$1,545,286
	Z2.1 Design Allowance	1.00	2,294		\$518.17	\$1,188,689	
	Z2.2 Escalation Allowance	1.00	2,294		Excluded		
	Z2.3 Construction Allowance	1.00	2,294	m2	\$155.45	\$356,597	
	Total				\$299	per sf	\$7,390,000

# ELEMENTAL SUMMARY CARBON COSTING STUDY - GENERIC STAND ALONE RETAIL 100% CARBON REDUCTION



CLASS D ESTIMATE (Rev.1) NOVEMBER 22, 2018

Gross Floor Area (m2) 2,294 Cost Per m2 3,399

140 V LIMBER 22, 2010					ost Per m2	3,399
				Location :	C	algary
			Elem	ental Cost		
Description Element\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A. SHELL						
A1. Sub-Structure						\$314,383
A1.1 Foundations	1.00	2,294	m2	\$137.05	\$314,383	
A2. Structure						\$870,339
A2.1 Lowest Floor Construction A2.3 Roof Construction	1.00 1.00	2,294 2,294		\$142.56 \$236.84	\$327,036 \$543,304	
A3. Exterior Enclosure						\$1,243,407
A3.2 Walls Above Grade A3.3 Windows & Entrances A3.4 Roof Finish A3.5 Projections	0.51 0.01 1.00 1.00	1,177 29 2,294 2,294	m2 m2	\$529.63 \$1,016.61 \$229.67 \$27.76	\$623,377 \$29,482 \$526,864 \$63,684	
B. INTERIORS						
B1 Partitions & Doors						\$235,382
B1.1 Partitions B1.2 Doors	0.56 0.02	1,275 54	m2 m2	\$141.26 \$1,023.67	\$180,104 \$55,278	
B2 Finishes						\$234,479
B2.1 Floor Finishes B2.2 Ceiling Finishes B2.3 Wall Finishes	1.00 1.00 0.51	2,294 2,294 1,177	m2	\$46.57 \$43.53 \$23.60	\$106,840 \$99,859 \$27,780	
B3 Fittings & Equipment						\$138,635
B3.1 Fittings & Fixtures B3.2 Equipment	1.00 1.00	2,294 2,294		\$53.92 \$6.51	\$123,695 \$14,940	
C. SERVICES						
C1 Mechanical						\$1,597,266
C1.1 Plumbing & Drainage C1.2 Fire Protection C1.3 Heating, Ventilation, Air Cond. C1.4 Controls	1.00 1.00 1.00 1.00	2,294 2,294 2,294 2,294	m2 m2	\$62.20 \$20.16 \$547.46 \$66.46	\$142,689 \$46,243 \$1,255,883 \$152,451	
C2 Electrical						\$711,002
C2.1 Service & Distribution C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries	1.00 1.00 1.00	2,294 2,294 2,294	m2	\$53.04 \$213.54 \$43.36	\$121,664 \$489,866 \$99,472	
D. SITE & ANCILLARY WORK						
D1 Site Work						\$24,654
D1.3 Electrical Site Services	0.20	460	m2	\$53.60	\$24,654	
Z. GENERAL REQUIREMENTS & ALLOWANCES						
Z1 General Requirements & Fees						\$816,919
Z1.1 General Requirements Z1.2 Fees	1.00 1.00	2,294 2,294		\$227.60 \$128.52	\$522,103 \$294,816	
Z2 Allowances						\$1,611,628
Z2.1 Design Allowance Z2.2 Escalation Allowance	1.00	2,294 2,294	m2	\$540.42 Excluded	\$1,239,721	
Z2.3 Construction Allowance	1.00	2,294	m2	\$162.12	\$371,906	
Total				\$316	per sf	\$7,798,000

ELEMENTAL SUMMARY
CARBON COSTING STUDY - GENERIC
STAND ALONE RETAIL 100% CARBON
REDUCTION



CLASS D ESTIMATE (Rev.1)

NOVEMBER 22, 2018 Gross Floor Area (m2) 2,294 Cost Per m2 3,418

					Location :	To	oronto
				Elem	ental Cost		
	scription ement\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A.	SHELL						
Α1	. Sub-Structure						\$299,412
	A1.1 Foundations	1.00	2,294	m2	\$130.52	\$299,412	
<b>A2</b>	. Structure						\$873,83
	A2.1 Lowest Floor Construction A2.3 Roof Construction	1.00 1.00	2,294 2,294		\$143.13 \$237.79	\$328,349 \$545,486	
А3	. Exterior Enclosure						\$1,248,40°
	A3.2 Walls Above Grade A3.3 Windows & Entrances A3.4 Roof Finish A3.5 Projections	0.51 0.01 1.00 1.00	1,177 29 2,294 2,294	m2 m2	\$531.76 \$1,020.69 \$230.59 \$27.87	\$625,881 \$29,600 \$528,980 \$63,940	
В.	INTERIORS						
В1	Partitions & Doors						\$236,327
	B1.1 Partitions B1.2 Doors	0.56 0.02	1,275 54	m2 m2	\$141.83 \$1,027.78	\$180,827 \$55,500	
B2	Finishes						\$222,690
	B2.1 Floor Finishes B2.2 Ceiling Finishes B2.3 Wall Finishes	1.00 1.00 0.51	2,294 2,294 1,177	m2	\$44.15 \$41.70 \$21.89	\$101,270 \$95,650 \$25,770	
ВЗ	Fittings & Equipment						\$139,192
	B3.1 Fittings & Fixtures B3.2 Equipment	1.00 1.00	2,294 2,294		\$54.14 \$6.54	\$124,192 \$15,000	
C.	SERVICES						
C1	Mechanical						\$1,636,543
	C1.1 Plumbing & Drainage C1.2 Fire Protection C1.3 Heating, Ventilation, Air Cond. C1.4 Controls	1.00 1.00 1.00 1.00	2,294 2,294 2,294 2,294	m2 m2	\$63.73 \$20.65 \$560.93 \$68.09	\$146,198 \$47,380 \$1,286,765 \$156,200	
C2	Electrical		,				\$721,830
	C2.1 Service & Distribution C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries	1.00 1.00 1.00	2,294 2,294 2,294	m2	\$53.84 \$216.79 \$44.02	\$123,517 \$497,326 \$100,986	
D.	SITE & ANCILLARY WORK						
D1	Site Work						\$24,753
	D1.3 Electrical Site Services	0.20	460	m2	\$53.81	\$24,753	
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$820,200
	Z1.1 General Requirements Z1.2 Fees	1.00 1.00	2,294 2,294		\$228.51 \$129.03	\$524,200 \$296,000	
<b>Z</b> 2	Allowances						\$1,618,100
	Z2.1 Design Allowance Z2.2 Escalation Allowance Z2.3 Construction Allowance	1.00 1.00 1.00	2,294 2,294 2,294	m2	\$542.59 Excluded \$162.77	\$1,244,700 \$373,400	
		1.00	2,294	1112			
	Total	<u> </u>			\$318	per sf	\$7,841,000

# ELEMENTAL SUMMARY CARBON COSTING STUDY - GENERIC STAND ALONE RETAIL 100% CARBON REDUCTION



CLASS D ESTIMATE (Rev.1) NOVEMBER 22, 2018

Gross Floor Area (m2) 2,294 Cost Per m2 3,343

140 V LIMBER 22, 2010					ost Per m2	3,343
				Location :	0	ttawa
			Elem	ental Cost		_
Description Element\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A. SHELL						
A1. Sub-Structure						\$291,328
A1.1 Foundations	1.00	2,294	m2	\$127.00	\$291,328	
A2. Structure						\$856,358
A2.1 Lowest Floor Construction A2.3 Roof Construction	1.00 1.00	2,294 2,294		\$140.27 \$233.03	\$321,782 \$534,576	
A3. Exterior Enclosure						\$1,223,433
A3.2 Walls Above Grade A3.3 Windows & Entrances A3.4 Roof Finish A3.5 Projections	0.51 0.01 1.00 1.00	1,177 29 2,294 2,294	m2 m2	\$521.12 \$1,000.28 \$225.98 \$27.32	\$613,363 \$29,008 \$518,400 \$62,661	
B. INTERIORS						
B1 Partitions & Doors						\$231,600
B1.1 Partitions B1.2 Doors	0.56 0.02	1,275 54	m2 m2	\$138.99 \$1,007.22	\$177,210 \$54,390	
B2 Finishes						\$211,058
B2.1 Floor Finishes B2.2 Ceiling Finishes B2.3 Wall Finishes	1.00 1.00 0.51	2,294 2,294 1,177	m2	\$42.16 \$39.03 \$21.08	\$96,713 \$89,528 \$24,817	
B3 Fittings & Equipment						\$136,408
B3.1 Fittings & Fixtures B3.2 Equipment	1.00 1.00	2,294 2,294		\$53.05 \$6.41	\$121,708 \$14,700	
C. SERVICES						
C1 Mechanical						\$1,582,537
C1.1 Plumbing & Drainage C1.2 Fire Protection C1.3 Heating, Ventilation, Air Cond. C1.4 Controls	1.00 1.00 1.00 1.00	2,294 2,294 2,294 2,294	m2 m2	\$61.63 \$19.97 \$542.42 \$65.84	\$141,373 \$45,816 \$1,244,302 \$151,045	
C2 Electrical						\$721,108
C2.1 Service & Distribution C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries	1.00 1.00 1.00	2,294 2,294 2,294	m2	\$53.79 \$216.58 \$43.98	\$123,394 \$496,829 \$100,885	
D. SITE & ANCILLARY WORK						
D1 Site Work						\$24,258
D1.3 Electrical Site Services	0.20	460	m2	\$52.73	\$24,258	
Z. GENERAL REQUIREMENTS & ALLOWANCES						
Z1 General Requirements & Fees						\$803,796
Z1.1 General Requirements Z1.2 Fees	1.00 1.00	2,294 2,294		\$223.94 \$126.45	\$513,716 \$290,080	
Z2 Allowances						\$1,585,738
Z2.1 Design Allowance Z2.2 Escalation Allowance	1.00	2,294 2,294	m2	\$531.74 Excluded	\$1,219,806	
Z2.3 Construction Allowance	1.00	2,294	m2	\$159.52	\$365,932	
Total				\$311	per sf	\$7,668,000

ELEMENTAL SUMMARY
CARBON COSTING STUDY - GENERIC
STAND ALONE RETAIL 100% CARBON
REDUCTION



CLASS D ESTIMATE (Rev.1)

NOVEMBER 22, 2018 Gross Floor Area (m2) 2,294 Cost Per m2 3,245

					Location :	Mo	ontreal
				Elem	ental Cost		
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A.	SHELL						
<b>A</b> 1	. Sub-Structure						\$291,328
	A1.1 Foundations	1.00	2,294	m2	\$127.00	\$291,328	
<b>A2</b>	. Structure						\$836,260
	A2.1 Lowest Floor Construction A2.3 Roof Construction	1.00 1.00	2,294 2,294		\$136.98 \$227.56	\$314,230 \$522,030	
А3	. Exterior Enclosure						\$1,194,720
	A3.2 Walls Above Grade A3.3 Windows & Entrances A3.4 Roof Finish A3.5 Projections	0.51 0.01 1.00 1.00	1,177 29 2,294 2,294	m2 m2	\$508.89 \$976.80 \$220.68 \$26.67	\$598,968 \$28,327 \$506,234 \$61,191	
В.	INTERIORS						
В1	Partitions & Doors						\$226,16
	B1.1 Partitions B1.2 Doors	0.56 0.02	1,275 54	m2 m2	\$135.73 \$983.58	\$173,051 \$53,114	
B2	Finishes						\$222,680
	B2.1 Floor Finishes B2.2 Ceiling Finishes B2.3 Wall Finishes	1.00 1.00 0.51	2,294 2,294 1,177	m2	\$44.59 \$41.36 \$21.68	\$102,283 \$94,885 \$25,512	
ВЗ	Fittings & Equipment						\$133,207
	B3.1 Fittings & Fixtures B3.2 Equipment	1.00 1.00	2,294 2,294		\$51.81 \$6.26	\$118,852 \$14,355	
C.	SERVICES						
C1	Mechanical						\$1,517,07
	C1.1 Plumbing & Drainage C1.2 Fire Protection C1.3 Heating, Ventilation, Air Cond. C1.4 Controls	1.00 1.00 1.00 1.00	2,294 2,294 2,294 2,294	m2 m2	\$59.08 \$19.15 \$519.98 \$63.12	\$135,526 \$43,921 \$1,192,831 \$144,797	
C2	Electrical						\$664,083
	C2.1 Service & Distribution C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries	1.00 1.00 1.00	2,294 2,294 2,294	m2	\$49.54 \$199.45 \$40.50	\$113,636 \$457,540 \$92,908	
D.	SITE & ANCILLARY WORK						
D1	Site Work						\$23,689
	D1.3 Electrical Site Services	0.20	460	m2	\$51.50	\$23,689	
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$784,931
	Z1.1 General Requirements Z1.2 Fees	1.00 1.00	2,294 2,294		\$218.68 \$123.48		
<b>Z</b> 2	Allowances						\$1,548,522
	Z2.1 Design Allowance Z2.2 Escalation Allowance Z2.3 Construction Allowance	1.00 1.00	2,294	m2	\$519.26 Excluded		
	ZZ.0 CONSTRUCTION ANOWANCE	1.00	2,294	IIIZ	\$155.77	\$357,344	
	Total				\$301	per sf	\$7,443,000

#### **ELEMENTAL SUMMARY CARBON COSTING STUDY - GENERIC STAND ALONE RETAIL 100% CARBON** REDUCTION



\$7,294,000

\$295 per sf

CLASS D ESTIMATE (Rev.1)

Total

NOVEMBER 22, 2018 Gross Floor Area (m2) 2,294 Cost Per m2 3,180 Halifax Location: **Elemental Cost** Sub Element Description Unit Element\Sub-Element Rate A. SHELL A1. Sub-Structure \$267,375 A1.1 Foundations 1.00 2,294 m2 \$267,375 \$116.55 A2. Structure \$816,162 A2.1 Lowest Floor Construction 1.00 2,294 m2 \$133.69 \$306,678 2,294 m2 A2.3 Roof Construction 1.00 \$222.09 \$509,484 A3. Exterior Enclosure \$1,166,007 A3.2 Walls Above Grade 1,177 m2 0.51 \$496.66 \$584,573 A3.3 Windows & Entrances 0.01 29 m2 \$953.32 \$27,646 A3.4 Roof Finish 2,294 m2 1.00 \$215.37 \$494,067 A3.5 Projections 2,294 m2 1.00 \$26.03 \$59,720 **B. INTERIORS B1 Partitions & Doors** \$220,729 **B1.1 Partitions** 0.56 1,275 m2 \$132.46 \$168,892 B1.2 Doors 0.02 54 m2 \$959.94 \$51,837 **B2** Finishes \$202,614 **B2.1 Floor Finishes** 1.00 2,294 m2 \$40.13 \$92,054 **B2.2 Ceiling Finishes** 1.00 2,294 m2 \$37.57 \$86,181 1,177 m2 B2.3 Wall Finishes 0.51 \$20.71 \$24,378 B3 Fittings & Equipment \$130,005 B3.1 Fittings & Fixtures 1.00 2,294 m2 \$50.56 \$115,995 B3.2 Equipment 1.00 2,294 m2 \$14,010 \$6.11 C. SERVICES C1 Mechanical \$1,518,712 C1.1 Plumbing & Drainage 1.00 2,294 m2 \$135,672 \$59.14 C1.2 Fire Protection 2,294 m2 1.00 \$19.17 \$43,969 C1.3 Heating, Ventilation, Air Cond. 2,294 m2 1.00 \$520.54 \$1,194,118 C1.4 Controls 1.00 2,294 m2 \$63.19 \$144,954 C2 Electrical \$672,023 C2.1 Service & Distribution 1.00 2,294 m2 \$50.13 \$114,995 C2.2 Lighting, Devices & Heating 2,294 m2 1.00 \$201.84 \$463,011 C2.3 Systems & Ancillaries 1.00 2,294 m2 \$40.98 \$94,018 D. SITE & ANCILLARY WORK D1 Site Work \$23,119 D1.3 Electrical Site Services 0.20 460 m2 \$50.26 \$23,119 Z. GENERAL REQUIREMENTS & ALLOWANCES Z1 General Requirements & Fees \$766,067 Z1.1 General Requirements 1.00 2,294 m2 \$213.43 \$489.603 Z1.2 Fees 1.00 2,294 m2 \$120.52 \$276,464 Z2 Allowances \$1,511,305 Z2.1 Design Allowance 1.00 2,294 m2 \$506.78 \$1,162,550 Z2.2 Escalation Allowance 2,294 m2 1.00 Excluded Z2.3 Construction Allowance 1.00 2,294 m2 \$152.03 \$348,756

#### **ELEMENTAL SUMMARY CARBON COSTING STUDY - PRIMARY SCHOOL BASE BUILDING**



Z2.3 Construction Allowance

Total

	ASS D ESTIMATE (Rev.3) DVEMBER 22, 2018				Gross Floor		6,871
						ost Per m2	2,978
				Elam	Location : ental Cost	var	couver
Des	scription			Elelli	Unit	Sub	Element
	ment\Sub-Element	Ratio	Quantity	Unit	Rate	Element	Total
A.	SHELL						
A1	Sub-Structure						\$1,220,779
	A1.1 Foundations	1.00	6,871	m2	\$177.67	\$1,220,779	
۸2	Structure	1.00	0,071	1112	ψ177.07	Ψ1,220,773	\$1,925,304
<b> </b> ^_	A2.1 Lowest Floor Construction	4.00	0.074		407.00	#000 000	\$1,923,304
	A2.3 Roof Construction	1.00 1.00			\$87.82 \$192.39	\$603,393 \$1,321,911	
Δ3	Exterior Enclosure	1.00	0,011		<b>\$102.00</b>	ψ1,021,011	\$2,408,978
	A3.2 Walls Above Grade	0.24	4 622	O	¢424.00	¢602.004	ΨΣ,400,010
	A3.3 Windows & Entrances	0.24 0.13	,	m2	\$424.98 \$541.45	\$693,984 \$496,600	
	A3.4 Roof Finish	1.00			\$154.83	\$1,063,851	
	A3.5 Projections	1.00	6,871		\$22.49	\$154,543	
В.	INTERIORS						
В1	Partitions & Doors						\$1,744,502
	B1.1 Partitions	0.98	6,734	m2	\$215.83	\$1,453,418	¥ 1,1 1 1,000
	B1.2 Doors	0.98	,	m2	\$1,082.10	\$291,084	
B2	Finishes				. ,,,	, , , , , ,	\$1,083,858
	B2.1 Floor Finishes	0.05	6 507	O	¢00 E4	¢577.740	ψ1,000,000
	B2.2 Ceiling Finishes	0.95 0.95	· ·		\$88.51 \$52.58	\$577,749 \$343,205	
	B2.3 Wall Finishes	1.70			\$13.96	\$162,904	
вз	Fittings & Equipment		,			. ,	\$682,968
	B3.1 Fittings & Fixtures	1.00	6,871	m2	\$89.67	\$616,118	, ,
	B3.2 Equipment	1.00	1		\$9.73	\$66,850	
c.	SERVICES		,		·	,	
	Mechanical						\$2,970,911
<u>ا</u> ``		1.00	6.074	O	¢440.07	¢764.000	Ψ2,570,511
	C1.1 Plumbing & Drainage C1.2 Fire Protection	1.00 1.00			\$110.87 \$29.65	\$761,802 \$203,718	
	C1.3 Heating, Ventilation, Air Cond.	1.00			\$29.03 \$257.02	\$1,766,003	
	C1.4 Controls	1.00			\$34.84	\$239,389	
C2	Electrical						\$1,908,451
	C2.1 Service & Distribution	1.00	6,871	m2	\$45.82	\$314,815	
	C2.2 Lighting, Devices & Heating	1.00	1		\$118.60	\$814,928	
	C2.3 Systems & Ancillaries	1.00			\$113.33	\$778,709	
D.	SITE & ANCILLARY WORK						
D1	Site Work						\$91,318
	D1.3 Electrical Site Services	1.00	6,871	m2	\$13.29	\$91,318	
ļ,	GENERAL REQUIREMENTS	1.00	0,071	1112	ψ10.23	ψ51,510	
	& ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$2,161,070
1	Z1.1 General Requirements	1.00	6,871	m2	\$200.90	\$1,380,357	
1	Z1.2 Fees	1.00	6,871	m2	\$113.62	\$780,713	
Z2	Allowances						\$4,262,834
1	Z2.1 Design Allowance	1.00	6,871	m2	\$477.24	\$3,279,088	
1	Z2.2 Escalation Allowance	1.00	6,871	m2	Excluded		

1.00

6,871 m2

\$143.17

\$277 per sf

\$983,746

\$20,461,000

A.W. HOOKER ASSOCIATES LTD. PROJECT NO:116065 PAGE C1 A.W. HOOKER ASSOCIATES LTD. PAGE C1 PROJECT NO:116065

#### **ELEMENTAL SUMMARY CARBON COSTING STUDY - PRIMARY** SCHOOL BASE BUILDING



CLASS D ESTIMATE (Rev.3) NOVEMBER 22, 2018

Gross Floor Area (m2) Cost Per m2 6,871

						ost Per m2	3,142
					Location :	C	algary
				Elem	ental Cost		
	ccription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A.	SHELL						
A1.	Sub-Structure						\$1,339,413
	A1.1 Foundations	1.00	6,871	m2	\$194.94	\$1,339,413	
A2.	Structure						\$2,007,961
	A2.1 Lowest Floor Construction	1.00	6,871	m2	\$91.59	\$629,298	
	A2.3 Roof Construction	1.00	6,871		\$200.65	\$1,378,663	
А3.	Exterior Enclosure						\$2,512,400
	A3.2 Walls Above Grade	0.24	1,633	m2	\$443.22	\$723,778	
	A3.3 Windows & Entrances	0.13	917	m2	\$564.69	\$517,920	
	A3.4 Roof Finish	1.00	6,871	m2	\$161.48	\$1,109,524	
	A3.5 Projections	1.00	6,871	m2	\$23.46	\$161,178	
В.	INTERIORS						
В1	Partitions & Doors						\$1,819,397
	B1.1 Partitions	0.98	6,734	m2	\$225.10	\$1,515,816	
	B1.2 Doors	0.04	269	m2	\$1,128.55	\$303,581	
B2	Finishes						\$1,138,197
	B2.1 Floor Finishes	0.95	6,527	m2	\$86.70	\$565,947	
	B2.2 Ceiling Finishes	0.95	6,527	m2	\$58.52	\$381,989	
	B2.3 Wall Finishes	1.70	11,668	m2	\$16.31	\$190,261	
В3	Fittings & Equipment						\$712,289
	B3.1 Fittings & Fixtures	1.00	6,871	m2	\$93.52	\$642,569	
	B3.2 Equipment	1.00	6,871	m2	\$10.15	\$69,720	
C.	SERVICES						
C1	Mechanical						\$3,175,914
	C1.1 Plumbing & Drainage	1.00	6,871	m2	\$118.52	\$814,369	
	C1.2 Fire Protection	1.00	6,871	m2	\$31.69	\$217,775	
	C1.3 Heating, Ventilation, Air Cond.	1.00	6,871	m2	\$274.76	\$1,887,863	
	C1.4 Controls	1.00	6,871	m2	\$37.24	\$255,907	
C2	Electrical						\$2,088,694
	C2.1 Service & Distribution	1.00	6,871	m2	\$50.15	\$344,547	
	C2.2 Lighting, Devices & Heating	1.00	6,871		\$129.81	\$891,893	
Ļ	C2.3 Systems & Ancillaries	1.00	6,871	m2	\$124.04	\$852,253	
	SITE & ANCILLARY WORK						
וטו	Site Work						\$95,238
	D1.3 Electrical Site Services	1.00	6,871	m2	\$13.86	\$95,238	
Z.	& ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$2,253,848
	Z1.1 General Requirements	1.00	6,871		\$209.52	\$1,439,618	
72	Z1.2 Fees	1.00	6,871	mz	\$118.50	\$814,230	
Z 2	Allowances						\$4,445,845
	Z2.1 Design Allowance	1.00	6,871		\$497.72	\$3,419,866	
	Z2.2 Escalation Allowance Z2.3 Construction Allowance	1.00 1.00	6,871 6,871		Excluded \$149.32	\$1,025,980	
	Total				\$292	per sf	\$21,589,000
1					¥-52	r	7,000,000

#### **ELEMENTAL SUMMARY CARBON COSTING STUDY - PRIMARY** SCHOOL BASE BUILDING



	ASS D ESTIMATE (Rev.3) DVEMBER 22, 2018				Gross Floor	r Area (m2)	6,871
140	7 V LIVIBLI ( 22, 2010					ost Per m2	3,148
					Location:	To	ronto
				Elem	ental Cost		
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A.	SHELL						
Α1	. Sub-Structure						\$1,275,631
	A1.1 Foundations	1.00	6,871	m2	\$185.65	\$1,275,631	
Α2	. Structure						\$2,016,026
	A2.1 Lowest Floor Construction	1.00	6,871	m2	\$91.96	\$631,826	
	A2.3 Roof Construction	1.00	6,871	m2	\$201.46	\$1,384,200	
А3	. Exterior Enclosure						\$2,522,490
İ	A3.2 Walls Above Grade	0.24	1,633	m2	\$445.00	\$726,685	
	A3.3 Windows & Entrances	0.13		m2	\$566.96	\$520,000	
	A3.4 Roof Finish	1.00	6,871		\$162.13	\$1,113,980	
	A3.5 Projections	1.00	6,871	m∠	\$23.55	\$161,825	
	INTERIORS						
В1	Partitions & Doors						\$1,826,704
	B1.1 Partitions B1.2 Doors	0.98	6,734		\$226.00	\$1,521,904	
		0.04	269	m2	\$1,133.09	\$304,800	
B2	Finishes						\$1,078,827
	B2.1 Floor Finishes	0.95	6,527		\$82.18	\$536,443	
	B2.2 Ceiling Finishes B2.3 Wall Finishes	0.95 1.70	6,527 11,668		\$56.06 \$15.13	\$365,890 \$176,494	
ВЗ	Fittings & Equipment	1.70	11,000	1112	ψ15.15	Ψ170,494	\$74E 4E0
Ь3		4.00	0.074		***	2015 150	\$715,150
	B3.1 Fittings & Fixtures B3.2 Equipment	1.00 1.00	6,871 6,871		\$93.89 \$10.19	\$645,150 \$70,000	
C	SERVICES	1.00	0,071	1112	ψ10.13	ψ10,000	
	Mechanical						£2.054.040
C I		4.00	0.074		<b>*</b> 101.11	****	\$3,254,010
	C1.1 Plumbing & Drainage C1.2 Fire Protection	1.00 1.00	6,871 6,871		\$121.44 \$32.47	\$834,394 \$223,130	
	C1.3 Heating, Ventilation, Air Cond.	1.00	6,871		\$281.51	\$1,934,286	
	C1.4 Controls	1.00	6,871		\$38.16	\$262,200	
C2	Electrical						\$2,120,502
	C2.1 Service & Distribution	1.00	6,871	m2	\$50.91	\$349,794	
	C2.2 Lighting, Devices & Heating	1.00	6,871	m2	\$131.78	\$905,475	
	C2.3 Systems & Ancillaries	1.00	6,871	m2	\$125.93	\$865,232	
D.	SITE & ANCILLARY WORK						
D1	Site Work						\$95,621
	D1.3 Electrical Site Services	1.00	6,871	m2	\$13.92	\$95,621	
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$2,262,900
	Z1.1 General Requirements	1.00	6,871		\$210.36	\$1,445,400	
	Z1.2 Fees	1.00	6,871	m2	\$118.98	\$817,500	
Z2	Allowances						\$4,463,700
	Z2.1 Design Allowance	1.00	6,871		\$499.72	\$3,433,600	
	Z2.2 Escalation Allowance	1.00	6,871		Excluded	04.000.105	
	Z2.3 Construction Allowance	1.00	6,871	m2	\$149.92	\$1,030,100	
	Total				\$292	per sf	\$21,632,000

## ELEMENTAL SUMMARY CARBON COSTING STUDY - PRIMARY SCHOOL BASE BUILDING



CLASS D ESTIMATE (Rev.3) NOVEMBER 22, 2018

Gross Floor Area (m2) 6,871 Cost Per m2 3.079

				C	ost Per m2	3,079
				Location :	0	ttawa
			Elem	ental Cost		
Description Element\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A. SHELL						
A1. Sub-Structure						\$1,241,189
A1.1 Foundations	1.00	6,871	m2	\$180.64	\$1,241,189	
A2. Structure		0,011		<b>\$100.0</b> 1	ψ1,211,100	\$1,975,705
A2.1 Lowest Floor Construction	4.00	0.074		000.40	0040 400	\$1,973,703
A2.1 Lowest Floor Construction A2.3 Roof Construction	1.00 1.00	6,871 6,871		\$90.12 \$197.43	\$619,189 \$1,356,516	
A3. Exterior Enclosure		3,57		\$1011.10	ψ1,000,010	\$2,472,040
A3.2 Walls Above Grade	0.24	1,633		¢426.40	¢740.4€4	ΨΣ,41Σ,040
A3.2 Walls Above Grade A3.3 Windows & Entrances	0.24 0.13		m2 m2	\$436.10 \$555.62	\$712,151 \$509,600	
A3.4 Roof Finish	1.00	6,871		\$158.89	\$1,091,700	
A3.5 Projections	1.00	6,871		\$23.08	\$158,589	
B. INTERIORS						
B1 Partitions & Doors						\$1,790,169
B1.1 Partitions	0.00	0.704		0004.40	04 404 405	ψ1,730,103
B1.1 Partitions B1.2 Doors	0.98 0.04	6,734	m2 m2	\$221.48 \$1,110.42	\$1,491,465 \$298,704	
B2 Finishes	0.04	209	1112	Ψ1,110.42	Ψ290,704	£4.024.740
						\$1,024,740
B2.1 Floor Finishes	0.95	6,527		\$78.48	\$512,303	
B2.2 Ceiling Finishes B2.3 Wall Finishes	0.95 1.70	6,527 11,668		\$52.47 \$14.57	\$342,473 \$169,964	
B3 Fittings & Equipment	1.70	11,000	1112	ψ14.57	ψ109,904	\$700 947
	4.00	0.074		***	****	\$700,847
B3.1 Fittings & Fixtures B3.2 Equipment	1.00 1.00	6,871 6,871		\$92.02 \$9.98	\$632,247 \$68,600	
	1.00	0,071	1112	ф9.90	\$00,000	
C. SERVICES						
C1 Mechanical						\$3,146,628
C1.1 Plumbing & Drainage	1.00	6,871		\$117.43		
C1.2 Fire Protection	1.00	6,871		\$31.40		
C1.3 Heating, Ventilation, Air Cond. C1.4 Controls	1.00 1.00	6,871 6,871		\$272.22 \$36.90	\$1,870,455 \$253,547	
C2 Electrical	1.00	0,071	1112	φ30.90	φ233,347	£0.440.004
						\$2,118,381
C2.1 Service & Distribution C2.2 Lighting, Devices & Heating	1.00	6,871		\$50.86	\$349,445	
C2.3 Systems & Ancillaries	1.00 1.00	6,871 6,871		\$131.65 \$125.80	\$904,570 \$864,367	
D. SITE & ANCILLARY WORK	1.00	0,071	1112	Ψ120.00	φουτ,σο <i>τ</i>	
						£02.700
D1 Site Work					***	\$93,708
D1.3 Electrical Site Services	1.00	6,871	m2	\$13.64	\$93,708	
Z. GENERAL REQUIREMENTS & ALLOWANCES						
Z1 General Requirements & Fees						\$2,217,642
Z1.1 General Requirements	1.00	6,871		\$206.16	\$1,416,492	
Z1.2 Fees	1.00	6,871	m2	\$116.60	\$801,150	• • • • •
Z2 Allowances						\$4,374,426
Z2.1 Design Allowance	1.00	, , , , , , , , , , , , , , , , , , ,		\$489.73	\$3,364,928	
Z2.2 Escalation Allowance Z2.3 Construction Allowance	1.00 1.00	6,871 6,871		Excluded \$146.92	\$1,009,498	
	1.00	0,071	1112			
Total				\$286	per sf	\$21,155,000

## ELEMENTAL SUMMARY CARBON COSTING STUDY - PRIMARY SCHOOL BASE BUILDING



CLASS D ESTIMATE (Rev.3) NOVEMBER 22, 2018

Description

Gross Floor Area (m2) 6,871
Cost Per m2 2,997
Location: Montreal

Elemental Cost
Unit Sub Element
Ratio Quantity Unit Rate Element Total

Ele	ment\Sub-Element	Ratio	Quantity	Unit	Rate	Element	Total
A.	SHELL						
<b>A</b> 1.	. Sub-Structure						\$1,241,189
	A1.1 Foundations	1.00	6,871	m2	\$180.64	\$1,241,189	
A2	. Structure						\$1,929,330
	A2.1 Lowest Floor Construction	1.00	6,871	m2	\$88.00	\$604,657	
	A2.3 Roof Construction	1.00	6,871	m2	\$192.79	\$1,324,679	
А3	Exterior Enclosure						\$2,414,023
	A3.2 Walls Above Grade	0.24	1,633	1	\$425.87	\$695,438	
	A3.3 Windows & Entrances A3.4 Roof Finish	0.13		m2	\$542.58	\$497,640	
	A3.4 Roof Finish A3.5 Projections	1.00 1.00	6,871 6,871		\$155.16 \$22.54	\$1,066,079 \$154,867	
В.	INTERIORS		0,0.		ψ <u>2</u> 2.5 .	<b>\$101,001</b>	
	Partitions & Doors						\$1,748,15
	B1.1 Partitions	0.98	6,734	m2	\$216.28	\$1,456,462	
	B1.2 Doors	0.04	· ·	m2	\$1,084.36	\$291,694	
B2	Finishes						\$1,079,500
	B2.1 Floor Finishes	0.95	6,527	m2	\$83.00	\$541,807	
	B2.2 Ceiling Finishes	0.95	6,527		\$55.61	\$362,963	
	B2.3 Wall Finishes	1.70	11,668	m2	\$14.97	\$174,729	
ВЗ	Fittings & Equipment						\$684,399
	B3.1 Fittings & Fixtures	1.00	6,871	1	\$89.86	\$617,409	
_	B3.2 Equipment	1.00	6,871	m2	\$9.75	\$66,990	
	SERVICES						
C1	Mechanical						\$3,016,467
	C1.1 Plumbing & Drainage C1.2 Fire Protection	1.00 1.00	6,871	1	\$112.57 \$30.10	\$773,483	
	C1.3 Heating, Ventilation, Air Cond.	1.00	6,871 6,871	1	\$260.96	\$206,842 \$1,793,083	
	C1.4 Controls	1.00	6,871	1	\$35.37	\$243,059	
C2	Electrical						\$1,950,861
	C2.1 Service & Distribution	1.00	6,871	m2	\$46.84	\$321,811	
	C2.2 Lighting, Devices & Heating	1.00	6,871	1	\$121.24	\$833,037	
_	C2.3 Systems & Ancillaries	1.00	6,871	m2	\$115.85	\$796,013	
	SITE & ANCILLARY WORK						
D1	Site Work						\$91,509
	D1.3 Electrical Site Services	1.00	6,871	m2	\$13.32	\$91,509	
Z.	& ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$2,165,59
	Z1.1 General Requirements	1.00	6,871	m2	\$201.32	\$1,383,248	
	Z1.2 Fees	1.00	6,871	m2	\$113.86	\$782,348	
Z2	Allowances						\$4,271,76
	Z2.1 Design Allowance	1.00		1	\$478.24	\$3,285,955	
	Z2.2 Escalation Allowance Z2.3 Construction Allowance	1.00			Excluded \$143.47		
	ZZ.O OUISHUUHUH AHUWAHUE	1.00	6,871	1112		\$985,806	
	Total				\$278	per sf	\$20,593,000

#### **ELEMENTAL SUMMARY CARBON COSTING STUDY - PRIMARY SCHOOL BASE BUILDING**



CLASS D ESTIMATE (Rev.3) NOVEMBER 22, 2018

Gross Floor Area (m2) 6,871 Cost Per m2 2.926

					C	ost Per m2	2,926
					Location :	H	alifax
				Elem	ental Cost		
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A.	SHELL						
Α1	. Sub-Structure						\$1,139,138
	A1.1 Foundations	1.00	6,871	m2	\$165.79	\$1,139,138	
A2	. Structure						\$1,882,968
	A2.1 Lowest Floor Construction A2.3 Roof Construction	1.00 1.00	6,871 6,871		\$85.89 \$188.16	\$590,125 \$1,292,843	
А3	. Exterior Enclosure						\$2,356,006
	A3.2 Walls Above Grade	0.24	1,633	m2	\$415.63	\$678,724	
	A3.3 Windows & Entrances	0.13	,	m2	\$529.54	\$485,680	
	A3.4 Roof Finish	1.00	6,871	m2	\$151.43	\$1,040,457	
	A3.5 Projections	1.00	6,871	m2	\$22.00	\$151,145	
В.	INTERIORS						
В1	Partitions & Doors						\$1,706,141
	B1.1 Partitions B1.2 Doors	0.98 0.04	-, -	m2 m2	\$211.09 \$1,058.30	\$1,421,458 \$284,683	
B2	Finishes				. ,	,	\$984,257
	B2.1 Floor Finishes	0.95	6,527	m2	\$74.70	\$487,627	<b>,</b>
	B2.2 Ceiling Finishes	0.95	6,527		\$50.51	\$329,667	
	B2.3 Wall Finishes	1.70			\$14.31	\$166,964	
ВЗ	Fittings & Equipment						\$667,950
	B3.1 Fittings & Fixtures	1.00	6,871	m2	\$87.70	\$602,570	
	B3.2 Equipment	1.00	6,871	m2	\$9.52	\$65,380	
C.	SERVICES						
C1	Mechanical						\$3,019,721
	C1.1 Plumbing & Drainage	1.00	6,871	m2	\$112.69	\$774,318	
	C1.2 Fire Protection	1.00	6,871	m2	\$30.14	\$207,065	
	C1.3 Heating, Ventilation, Air Cond.	1.00	· ·		\$261.25	\$1,795,017	
	C1.4 Controls	1.00	6,871	m2	\$35.41	\$243,322	
C2	Electrical						\$1,974,187
	C2.1 Service & Distribution	1.00	6,871		\$47.40	\$325,659	
	C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries	1.00 1.00	,		\$122.69 \$117.24	\$842,998 \$805,531	
h	SITE & ANCILLARY WORK	1.00	0,071	1112	Ψ117.24	ψ000,001	
	Site Work						\$89,310
٦.	D1.3 Electrical Site Services	1.00	6 074		¢12.00	¢00.240	
,		1.00	6,871	m2	\$13.00	\$89,310	
۷.	& ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$2,113,549
	Z1.1 General Requirements	1.00	· ·		\$196.48	\$1,350,004	
	Z1.2 Fees	1.00	6,871	m2	\$111.13	\$763,545	
Z2	Allowances						\$4,169,096
1	Z2.1 Design Allowance	1.00	1		\$466.74	\$3,206,982	
	Z2.2 Escalation Allowance Z2.3 Construction Allowance	1.00			Excluded	<b>#</b> 060 440	
<u> </u>	ZZ.3 CONSTRUCTION ANOWANCE	1.00	6,871	m∠	\$140.03	\$962,113	
1	Total	1			\$272	per sf	\$20,102,000

#### **ELEMENTAL SUMMARY CARBON COSTING STUDY - PRIMARY SCHOOL 100% CARBON REDUCTION**



CLASS D ESTIMATE (Rev.1)

NOVEMBER 22, 2018 Gross Floor Area (m2) 6,871 Cost Per m2 3,475 Location: Vancouver **Elemental Cost** Description
Element\Sub-Element Unit Sub Element Rate Total A. SHELL A1. Sub-Structure \$1,220,779 A1.1 Foundations 6,871 m2 1.00 \$177.67 \$1,220,779 A2. Structure \$1,925,304 A2.1 Lowest Floor Construction 1.00 6,871 m2 \$87.82 \$603,393 A2.3 Roof Construction 6,871 m2 1.00 \$192.39 \$1,321,91 A3. Exterior Enclosure \$2,864,269 A3.2 Walls Above Grade 1,633 m2 \$439.30 \$717,37 917 m2 A3.3 Windows & Entrances 0.13 \$797.72 \$731,645 A3.4 Roof Finish 6,871 m2 1.00 \$183.48 \$1,260,705 A3.5 Projections 6,871 m2 1.00 \$22.49 \$154,543 **B. INTERIORS B1 Partitions & Doors** \$1,744,502 **B1.1 Partitions** 0.98 6,734 m2 \$215.83 \$1,453,418 B1.2 Doors 0.04 269 m2 \$1,082.10 \$291,084 **B2** Finishes \$1,083,858 B2.1 Floor Finishes 0.95 6,527 m2 \$88.51 \$577.749 **B2.2 Ceiling Finishes** 0.95 6,527 m2 \$52.58 \$343,205 B2.3 Wall Finishes 1.70 11,668 m2 \$13.96 \$162,904 B3 Fittings & Equipment \$682,968 B3.1 Fittings & Fixtures 6,871 m2 1.00 \$89.67 \$616,118 B3.2 Equipment 6,871 m2 1.00 \$9.73 \$66,850 C. SERVICES C1 Mechanical \$4,610,989 C1.1 Plumbing & Drainage 1.00 6,871 m2 \$114.93 \$789,676 C1.2 Fire Protection 6,871 m2 1.00 \$29.65 \$203,718 C1.3 Heating, Ventilation, Air Cond. 6,871 m2 1.00 \$475.65 \$3,268,190 C1.4 Controls 1.00 6,871 m2 \$349,405 \$50.85 C2 Electrical \$2,140,633 C2.1 Service & Distribution 1.00 6,871 m2 \$55.21 \$379,314 C2.2 Lighting, Devices & Heating 1.00 6,871 m2 \$143.01 \$982,611 C2.3 Systems & Ancillaries 1.00 6,871 m2 \$778,709 \$113.33 D. SITE & ANCILLARY WORK D1 Site Work \$91,318 D1.3 Electrical Site Services 0.12 825 m2 \$110.69 \$91,318 Z. GENERAL REQUIREMENTS & ALLOWANCES \$2,528,076 Z1 General Requirements & Fees Z1.1 General Requirements 1.00 6,871 m2 \$235.02 \$1,614,810 Z1.2 Fees 1.00 6,871 m2 \$132.92 \$913,267 Z2 Allowances \$4,986,628 Z2.1 Design Allowance 1.00 6,871 m2 \$558.27 \$3,835,853

1.00

1.00

6,871 m2

6,871 m2

Excluded

\$167.48

\$323 per sf

\$1,150,775

\$23,879,000

A.W. HOOKER ASSOCIATES LTD. PROJECT NO:116065 PAGE C1 PAGE C1 A.W. HOOKER ASSOCIATES LTD. PROJECT NO:116065

Z2.2 Escalation Allowance

Total

Z2.3 Construction Allowance

## ELEMENTAL SUMMARY CARBON COSTING STUDY - PRIMARY SCHOOL 100% CARBON REDUCTION



CLASS D ESTIMATE (Rev.1) NOVEMBER 22, 2018

Gross Floor Area (m2) 6,871 Cost Per m2 3,669

					C	ost Per m2	3,669
					Location :	C	algary
				Elem	ental Cost	0.1	<b>-</b> 1
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A.	SHELL						
Δ1	. Sub-Structure						\$1,339,413
<b>.</b>	A1.1 Foundations	1.00	6.871	m2	\$194.94	\$1,339,413	
١,,	. Structure	1.00	0,071	1112	ψ194.94	ψ1,559,415	
AZ							\$2,007,961
	A2.1 Lowest Floor Construction A2.3 Roof Construction	1.00 1.00	6,871 6,871		\$91.59 \$200.65	\$629,298	
A 2		1.00	0,071	1112	\$200.03	\$1,378,663	
AS	. Exterior Enclosure						\$2,987,238
	A3.2 Walls Above Grade A3.3 Windows & Entrances	0.24	1,633		\$458.16	\$748,175	
	A3.4 Roof Finish	0.13 1.00	6,871	m2	\$831.97 \$191.36	\$763,056 \$1,314,830	
	A3.5 Projections	1.00	6,871		\$23.46	\$1,314,630 \$161,178	
L	INTERIORS	1.00	0,071	1112	Ψ20.40	ψισι,τισ	
							A
Bı	Partitions & Doors						\$1,819,397
	B1.1 Partitions	0.98	6,734		\$225.10	\$1,515,816	
L	B1.2 Doors	0.04	269	m2	\$1,128.55	\$303,581	
B2	Finishes						\$1,138,197
	B2.1 Floor Finishes	0.95	6,527	m2	\$86.70	\$565,947	
	B2.2 Ceiling Finishes	0.95	6,527		\$58.52	\$381,989	
	B2.3 Wall Finishes	1.70	11,668	m2	\$16.31	\$190,261	
B3	Fittings & Equipment						\$712,289
	B3.1 Fittings & Fixtures	1.00	6,871		\$93.52	\$642,569	
	B3.2 Equipment	1.00	6,871	m2	\$10.15	\$69,720	
C.	SERVICES						
C1	Mechanical						\$4,929,163
	C1.1 Plumbing & Drainage	1.00	6,871	m2	\$122.86	\$844,166	
	C1.2 Fire Protection	1.00	6,871	m2	\$31.69	\$217,775	
	C1.3 Heating, Ventilation, Air Cond.	1.00	6,871		\$508.47	\$3,493,706	
	C1.4 Controls	1.00	6,871	m2	\$54.36	\$373,515	
C2	Electrical						\$2,342,804
	C2.1 Service & Distribution	1.00	6,871	m2	\$60.42	\$415,138	
	C2.2 Lighting, Devices & Heating	1.00	6,871		\$156.51	\$1,075,413	
	C2.3 Systems & Ancillaries	1.00	6,871	m2	\$124.04	\$852,253	
	SITE & ANCILLARY WORK						
D1	Site Work						\$95,238
	D1.3 Electrical Site Services	0.12	825	m2	\$115.44	\$95,238	
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$2,636,611
	Z1.1 General Requirements	1.00	6,871	m2	\$245.11	\$1,684,136	
	Z1.2 Fees	1.00	6,871	m2	\$138.62	\$952,475	
Z2	Allowances						\$5,200,714
	Z2.1 Design Allowance	1.00	6,871	m2	\$582.23	\$4,000,534	
	Z2.2 Escalation Allowance	1.00	6,871	m2	Excluded		
	Z2.3 Construction Allowance	1.00	6,871	m2	\$174.67	\$1,200,180	
	Total				\$341	per sf	\$25,209,000

## ELEMENTAL SUMMARY CARBON COSTING STUDY - PRIMARY SCHOOL 100% CARBON REDUCTION



CLASS D ESTIMATE (Rev.1) NOVEMBER 22, 2018 Gross Floor Area (m2) 6,871 Cost Per m2 3,683 Location: Toronto **Elemental Cost** Description
Element\Sub-Element Unit Sub Element Rate Total A. SHELL A1. Sub-Structure \$1,275,631 A1.1 Foundations 6,871 m2 1.00 \$185.65 \$1,275,631 A2. Structure \$2,016,026 A2.1 Lowest Floor Construction 1.00 6,871 m2 \$91.96 \$631,826 A2.3 Roof Construction 6,871 m2 1.00 \$201.46 \$1,384,200 A3. Exterior Enclosure \$2,999,235 A3.2 Walls Above Grade 1,633 m2 \$460.00 \$751,180 917 m2 A3.3 Windows & Entrances 0.13 \$835.31 \$766,120 A3.4 Roof Finish 6,871 m2 \$1,320,110 1.00 \$192.13 A3.5 Projections 6,871 m2 1.00 \$23.55 \$161,825 **B. INTERIORS B1 Partitions & Doors** \$1,826,704 **B1.1 Partitions** 0.98 6,734 m2 \$226.00 \$1,521,904 B1.2 Doors 0.04 269 m2 \$1,133.09 \$304,800 **B2** Finishes \$1,078,827 B2.1 Floor Finishes 0.95 6,527 m2 \$82.18 \$536,443 **B2.2 Ceiling Finishes** 0.95 6,527 m2 \$56.06 \$365,890 B2.3 Wall Finishes 1.70 11,668 m2 \$15.13 \$176,494 B3 Fittings & Equipment \$715,150 B3.1 Fittings & Fixtures 6,871 m2 1.00 \$93.89 \$645,150 B3.2 Equipment 6,871 m2 1.00 \$10.19 \$70,000 C. SERVICES C1 Mechanical \$5,050,372 C1.1 Plumbing & Drainage 1.00 6,871 m2 \$125.88 \$864,925 C1.2 Fire Protection 6,871 m2 1.00 \$32.47 \$223,130 C1.3 Heating, Ventilation, Air Cond. 6,871 m2 1.00 \$520.97 \$3,579,617 C1.4 Controls 1.00 6,871 m2 \$382,700 \$55.70 C2 Electrical \$2,378,481 C2.1 Service & Distribution 1.00 6,871 m2 \$61.34 \$421,460 C2.2 Lighting, Devices & Heating 1.00 6,871 m2 \$158.90 \$1,091,790 C2.3 Systems & Ancillaries 6,871 m2 \$865,232 1.00 \$125.93 D. SITE & ANCILLARY WORK D1 Site Work \$95,621 D1.3 Electrical Site Services 0.12 825 m2 \$115.90 \$95,621 Z. GENERAL REQUIREMENTS & ALLOWANCES Z1 General Requirements & Fees \$2,647,200 Z1.1 General Requirements 1.00 6,871 m2 \$246.09 \$1,690,900 Z1.2 Fees 1.00 6,871 m2 \$139.18 \$956,300 Z2 Allowances \$5,221,600

1.00

1.00

1.00

6,871 m2

6,871 m2

6,871 m2

\$584.57

\$175.37

\$342 per sf

Excluded

\$4,016,600

\$1,205,000

\$25,305,000

A.W. HOOKER ASSOCIATES LTD. PROJECT NO:116065 PAGE C1 A.W. HOOKER ASSOCIATES LTD. PROJECT NO:116065 PAGE C1

Z2.1 Design Allowance

Total

Z2.2 Escalation Allowance

Z2.3 Construction Allowance

#### **ELEMENTAL SUMMARY CARBON COSTING STUDY - PRIMARY SCHOOL 100% CARBON REDUCTION**



CLASS D ESTIMATE (Rev.1) NOVEMBER 22, 2018

Gross Floor Area (m2) 6,871

						ost Per m2	3,600
					Location :	0	ttawa
Doc	scription			Elem	ental Cost	Sub	Flowers
	ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Element	Element Total
Α.	SHELL						
	Sub-Structure						\$1,241,189
	A1.1 Foundations	1.00	6.871	O	¢490.64	¢4 044 400	\$1,241,109
l.,		1.00	0,071	1112	\$180.64	\$1,241,189	
AZ	Structure						\$1,975,705
	A2.1 Lowest Floor Construction A2.3 Roof Construction	1.00	6,871		\$90.12	\$619,189	
l		1.00	6,871	m2	\$197.43	\$1,356,516	
A3	Exterior Enclosure						\$2,939,250
	A3.2 Walls Above Grade	0.24	1,633		\$450.80	\$736,156	
	A3.3 Windows & Entrances A3.4 Roof Finish	0.13 1.00	91 <i>7</i> 6,871	m2	\$818.60	\$750,798	
	A3.5 Projections	1.00	6,871		\$188.29 \$23.08	\$1,293,708 \$158,589	
R	INTERIORS		0,0		Ψ20.00	<b>\$100,000</b>	
	Partitions & Doors						£4.700.400
В							\$1,790,169
	B1.1 Partitions B1.2 Doors	0.98 0.04	6,734	m2 m2	\$221.48	\$1,491,465	
_		0.04	209	1112	\$1,110.42	\$298,704	*
B2	Finishes						\$1,024,740
	B2.1 Floor Finishes	0.95	6,527		\$78.48		
	B2.2 Ceiling Finishes B2.3 Wall Finishes	0.95 1.70	6,527 11,668		\$52.47 \$14.57	\$342,473 \$169,964	
D2	Fittings & Equipment	1.70	11,000	1112	Φ14.57	\$109,904	\$700 047
P							\$700,847
	B3.1 Fittings & Fixtures B3.2 Equipment	1.00 1.00	6,871 6,871		\$92.02	\$632,247	
		1.00	0,071	IIIZ	\$9.98	\$68,600	
1	SERVICES						
C1	Mechanical						\$4,883,709
	C1.1 Plumbing & Drainage	1.00	6,871		\$121.73		
	C1.2 Fire Protection	1.00	6,871		\$31.40		
	C1.3 Heating, Ventilation, Air Cond. C1.4 Controls	1.00 1.00	6,871 6,871		\$503.78 \$53.86	\$3,461,490 \$370,071	
C2	Electrical		0,011		<b>400.00</b>	40.0,01.	\$2,376,103
02	C2.1 Service & Distribution	4.00	0.074	0	¢04.00	¢404.000	
	C2.1 Service & Distribution C2.2 Lighting, Devices & Heating	1.00 1.00	6,871 6,871		\$61.28 \$158.74	\$421,038 \$1,090,698	
	C2.3 Systems & Ancillaries	1.00	6,871		\$125.80	\$864,367	
D.	SITE & ANCILLARY WORK						
	Site Work						\$93,708
	D1.3 Electrical Site Services	0.12	925	m2	\$113.59	\$93,708	
_	GENERAL REQUIREMENTS	0.12	023	1112	φ113.39	φσ3,100	
	& ALLOWANCES						
Z1	General Requirements & Fees						\$2,594,256
I .	Z1.1 General Requirements	1.00	6,871	m2	\$241.17	\$1,657,082	<del>+=,50+,200</del>
	Z1.2 Fees	1.00	6,871		\$136.40	\$937,174	
Z2	Allowances		-,-				\$5,117,168
1	Z2.1 Design Allowance	1.00	6,871	m?	\$572.88	\$3,936,268	
	Z2.2 Escalation Allowance	1.00	6,871		\$572.66 Excluded		
	Z2.3 Construction Allowance	1.00	6,871		\$171.87		
	Total			!	¢22 <i>1</i>	per sf	\$24,737,000
	i Otal				<b></b>	hei ai	Ψ <b>Σ-1</b> ,131,000

#### **ELEMENTAL SUMMARY CARBON COSTING STUDY - PRIMARY** SCHOOL 100% CARBON REDUCTION



CLASS D ESTIMATE (Rev.1)

NOVEMBER 22, 2018 Gross Floor Area (m2) 6,871 Cost Per m2 3,499 Montreal Location: Elemental Cost

					Unital Ocot		
	cription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
	SHELL						
A1.	Sub-Structure						\$1,241,189
	A1.1 Foundations	1.00	6,871	m2	\$180.64	\$1,241,189	¥ 1,= 11,11
A2.	Structure		5,51		<b>\$100.0</b> 1	Ψ1,211,100	\$1,929,336
	A2.1 Lowest Floor Construction	1.00	6,871	m2	\$88.00	\$604,657	<b>\$1,020,000</b>
	A2.3 Roof Construction	1.00	6,871		\$192.79	\$1,324,679	
A3.	Exterior Enclosure						\$2,870,268
	A3.2 Walls Above Grade	0.24	1,633	m2	\$440.22	\$718,879	
	A3.3 Windows & Entrances	0.13	917	m2	\$799.39	\$733,177	
	A3.4 Roof Finish	1.00	6,871	m2	\$183.87	\$1,263,345	
	A3.5 Projections	1.00	6,871	m2	\$22.54	\$154,867	
В.	INTERIORS						
В1	Partitions & Doors						\$1,748,155
	B1.1 Partitions	0.98	6,734		\$216.28	\$1,456,462	
	B1.2 Doors	0.04	269	m2	\$1,084.36	\$291,694	
B2	Finishes						\$1,079,500
	B2.1 Floor Finishes	0.95	6,527		\$83.00	\$541,807	
	B2.2 Ceiling Finishes B2.3 Wall Finishes	0.95	6,527		\$55.61	\$362,963	
D2		1.70	11,668	m2	\$14.97	\$174,729	2004.00
DJ	Fittings & Equipment					****	\$684,399
	B3.1 Fittings & Fixtures B3.2 Equipment	1.00 1.00	6,871 6,871		\$89.86 \$9.75	\$617,409 \$66,990	
C	SERVICES	1.00	0,071	1112	ψ3.70	ψ00,550	
	Mechanical						£4 694 60.
01		4.00	0.074	0	#44C CO	¢004.705	\$4,681,694
	C1.1 Plumbing & Drainage C1.2 Fire Protection	1.00 1.00	6,871 6,871		\$116.69 \$30.10	\$801,785 \$206,842	
	C1.3 Heating, Ventilation, Air Cond.	1.00	6,871		\$482.94	\$3,318,305	
	C1.4 Controls	1.00	6,871		\$51.63	\$354,763	
C2	Electrical						\$2,188,203
	C2.1 Service & Distribution	1.00	6,871	m2	\$56.43	\$387,743	
	C2.2 Lighting, Devices & Heating	1.00	6,871	m2	\$146.19	\$1,004,446	
	C2.3 Systems & Ancillaries	1.00	6,871	m2	\$115.85	\$796,013	
D.	SITE & ANCILLARY WORK						
D1	Site Work						\$91,509
	D1.3 Electrical Site Services	0.12	825	m2	\$110.92	\$91,509	
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$2,533,370
	Z1.1 General Requirements	1.00	6,871	m2	\$235.51	\$1,618,191	
	Z1.2 Fees	1.00	6,871	m2	\$133.19	\$915,179	
Z2	Allowances						\$4,997,071
	Z2.1 Design Allowance	1.00	6,871	m2	\$559.44	\$3,843,886	
	Z2.2 Escalation Allowance	1.00	6,871		Excluded		
	Z2.3 Construction Allowance	1.00	6,871	m2	\$167.83	\$1,153,185	
	Total				\$325	per sf	\$24,045,000

## ELEMENTAL SUMMARY CARBON COSTING STUDY - PRIMARY SCHOOL 100% CARBON REDUCTION



CLASS D ESTIMATE (Rev.1) NOVEMBER 22, 2018

Gross Floor Area (m2) 6,871 Cost Per m2 3,423

					C	ost Per m2	3,423
					Location :	H	alifax
				Elem	ental Cost		
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A.	SHELL						
A1.	. Sub-Structure						\$1,139,138
	A1.1 Foundations	1.00	6,871	m2	\$165.79	\$1,139,138	
A2.	. Structure						\$1,882,968
	A2.1 Lowest Floor Construction A2.3 Roof Construction	1.00 1.00	6,871 6,871		\$85.89 \$188.16	\$590,125 \$1,292,843	
A3.	Exterior Enclosure						\$2,801,285
İ	A3.2 Walls Above Grade	0.24	1,633	m2	\$429.64	\$701,602	
	A3.3 Windows & Entrances	0.13		m2	\$780.18	\$715,556	
	A3.4 Roof Finish	1.00	6,871	m2	\$179.45	\$1,232,983	
	A3.5 Projections	1.00	6,871	m2	\$22.00	\$151,145	
В.	INTERIORS						
В1	Partitions & Doors						\$1,706,141
	B1.1 Partitions	0.98	6,734		\$211.09		
	B1.2 Doors	0.04	269	m2	\$1,058.30	\$284,683	***
BZ	Finishes						\$984,257
	B2.1 Floor Finishes	0.95	6,527		\$74.70	\$487,627	
İ	B2.2 Ceiling Finishes B2.3 Wall Finishes	0.95 1.70	6,527 11,668		\$50.51 \$14.31	\$329,667 \$166,964	
В3	Fittings & Equipment	1.70	11,000	1112	ψ14.51	ψ100,904	\$667,950
	B3.1 Fittings & Fixtures	1.00	6,871	m2	\$87.70	\$602,570	<del>-</del> <del>-</del> <del>-</del> <del>-</del> <del>-</del> <del>-</del> <del>-</del> <del>-</del> <del>-</del> <del>-</del>
	B3.2 Equipment	1.00			\$9.52	\$65,380	
C.	SERVICES						
C1	Mechanical						\$4,686,745
İ	C1.1 Plumbing & Drainage	1.00	6,871	m2	\$116.82	\$802,650	
	C1.2 Fire Protection	1.00	6,871	m2	\$30.14	\$207,065	
	C1.3 Heating, Ventilation, Air Cond.	1.00	6,871		\$483.46	\$3,321,885	
Ca	C1.4 Controls  Electrical	1.00	6,871	m2	\$51.69	\$355,146	\$0.044.000
<b>6</b> 2							\$2,214,366
	C2.1 Service & Distribution C2.2 Lighting, Devices & Heating	1.00	- , -		\$57.11	\$392,379	
	C2.3 Systems & Ancillaries	1.00 1.00	6,871 6,871		\$147.93 \$117.24	\$1,016,456 \$805,531	
D.	SITE & ANCILLARY WORK		2,211		*****	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
	Site Work						\$89,310
	D1.3 Electrical Site Services	0.12	825	m2	\$108.25	\$89,310	
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$2,472,485
	Z1.1 General Requirements	1.00	6,871	m2	\$229.85	\$1,579,301	
	Z1.2 Fees	1.00	6,871	m2	\$129.99		
Z2	Allowances						\$4,876,974
	Z2.1 Design Allowance	1.00	6,871	m2	\$545.99	\$3,751,504	
	Z2.2 Escalation Allowance	1.00	,		Excluded		
	Z2.3 Construction Allowance	1.00	6,871	m2	\$163.80	\$1,125,470	
	Total				\$318	per sf	\$23,522,000

## ELEMENTAL SUMMARY CARBON COSTING STUDY - GENERIC WAREHOUSE BASE BUILDING



\$166 per sf

\$8,661,000

NC	ASS D ESTIMATE (Rev.1) OVEMBER 22, 2018				Gross Floor	Area (m2)		
					Location :		couver	
				Elem	ental Cost			
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total	
A.	SHELL							
Α1	. Sub-Structure						\$465,543	
	A1.1 Foundations	1.00	4,835	m2	\$96.29	\$465,543		
42	. Structure						\$1,647,319	
	A2.1 Lowest Floor Construction	1.00	4,835	m2	\$147.00	\$710,731		
	A2.3 Roof Construction	1.00	4,835	m2	\$193.71	\$936,588		
۹3	Exterior Enclosure						\$1,576,643	
	A3.2 Walls Above Grade	0.25	· ·		\$409.40	\$503,562		
	A3.3 Windows & Entrances	0.02		m2	\$1,109.08	\$131,981		
	A3.4 Roof Finish A3.5 Projections	1.00 1.00	4,835 4,835		\$182.13 \$12.51	\$880,601 \$60,499		
2	INTERIORS	1.00	4,000	1112	\$12.51	φ00,499		
	Partitions & Doors					_	£404.000	
<b>5</b> 1							\$121,930	
	B1.1 Partitions B1.2 Doors	1.00 0.01	4,835	m2 m2	\$19.55 \$856.52	\$94,521 \$27,409		
22	Finishes	0.01	32	1112	ψ030.32	Ψ21,409	¢00.22	
,_	B2.1 Floor Finishes	4.00	4.005	0	<b>C44.00</b>	#07.000	\$90,33	
	B2.1 Floor Finishes B2.2 Ceiling Finishes	1.00 1.00	4,835 4,835		\$14.00 \$3.53	\$67,668 \$17,090		
	B2.3 Wall Finishes	1.00	4,835		\$1.15	\$5,578		
33	Fittings & Equipment						\$158,702	
	B3.1 Fittings & Fixtures	1.00	4,835	m2	\$12.68	\$61,292	, , , , ,	
	B3.2 Equipment	1.00	4,835		\$20.15	\$97,410		
Э.	SERVICES					- 1		
21	Mechanical						\$937,29	
	C1.1 Plumbing & Drainage	1.00	4,835	m2	\$37.33	\$180,488	,,,,,	
	C1.2 Fire Protection	1.00	4,835		\$35.26	\$170,484		
	C1.3 Heating, Ventilation, Air Cond.	1.00	4,835	m2	\$99.73	\$482,214		
	C1.4 Controls	1.00	4,835	m2	\$21.53	\$104,105		
2	Electrical						\$705,29	
	C2.1 Service & Distribution	1.00			\$43.72	\$211,401		
	C2.2 Lighting, Devices & Heating	1.00			\$51.33	\$248,160		
_	C2.3 Systems & Ancillaries	1.00	4,835	m2	\$50.82	\$245,729		
	SITE & ANCILLARY WORK							
)1	Site Work						\$298,024	
	D1.1 Site Development	1.00	· · ·		\$50.77	\$245,461		
_	D1.3 Electrical Site Services	1.00	4,835	m2	\$10.87	\$52,564		
<u>′</u> .	GENERAL REQUIREMENTS & ALLOWANCES							
<b>Z</b> 1	General Requirements & Fees						\$856,820	
	Z1.1 General Requirements	1.00	4,835	m2	\$122.11	\$590,381		
	Z1.2 Fees	1.00	· ·		\$55.11	\$266,445		
<b>Z</b> 2	Allowances						\$1,803,422	
	Z2.1 Design Allowance	1.00	4,835	m2	\$286.91	\$1,387,233		
	Z2.2 Escalation Allowance	1.00	4,835	m2	Excluded			
	Z2.3 Construction Allowance	1.00	4,835	m2	\$86.08	\$416,189		

A.W. HOOKER ASSOCIATES LTD. PROJECT NO:116065 PAGE C1 A.W. HOOKER ASSOCIATES LTD. PROJECT NO:116065 PAGE C1

Total

## ELEMENTAL SUMMARY CARBON COSTING STUDY - GENERIC WAREHOUSE BASE BUILDING



CLASS D ESTIMATE (Rev.1) NOVEMBER 22, 2018

Gross Floor Area (m2) 4,835 Cost Per m2 1,886

				С	ost Per m2	1,886
				Location :	Ca	algary
Description			Elem	ental Cost	Cub	Flamont
Description Element\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A. SHELL						
A1. Sub-Structure						\$510,784
A1.1 Foundations	1.00	4,835	m2	\$105.64	\$510,784	
A2. Structure	1.00	1,000		ψ100.01	φο το, το τ	\$1,718,041
A2.1 Lowest Floor Construction	1.00	4,835		¢452.24	¢744 044	\$1,710,04
A2.3 Roof Construction	1.00 1.00	,		\$153.31 \$202.03	\$741,244 \$976,797	
A3. Exterior Enclosure		,			. ,	\$1,644,33°
A3.2 Walls Above Grade	0.25	1,230	m2	\$426.98	\$525,181	
A3.3 Windows & Entrances	0.02	,	m2	\$1,156.70	\$137,647	
A3.4 Roof Finish	1.00	4,835	m2	\$189.95	\$918,407	
A3.5 Projections	1.00	4,835	m2	\$13.05	\$63,097	
B. INTERIORS						
B1 Partitions & Doors						\$127,164
B1.1 Partitions	1.00	4,835	m2	\$20.39	\$98,579	
B1.2 Doors	0.01	32	m2	\$893.29	\$28,585	
B2 Finishes						\$91,822
B2.1 Floor Finishes	1.00	4,835	m2	\$13.71	\$66,286	
B2.2 Ceiling Finishes	1.00	4,835	m2	\$3.93	\$19,022	
B2.3 Wall Finishes	1.00	4,835	m2	\$1.35	\$6,515	
B3 Fittings & Equipment						\$165,515
B3.1 Fittings & Fixtures	1.00	4,835	m2	\$13.22	\$63,923	
B3.2 Equipment	1.00	4,835	m2	\$21.01	\$101,592	
C. SERVICES						
C1 Mechanical						\$1,001,967
C1.1 Plumbing & Drainage	1.00	4,835	m2	\$39.91	\$192,943	
C1.2 Fire Protection	1.00	4,835	m2	\$37.69	\$182,248	
C1.3 Heating, Ventilation, Air Cond.	1.00			\$106.62	\$515,488	
C1.4 Controls	1.00	4,835	m2	\$23.02	\$111,288	
C2 Electrical						\$771,902
C2.1 Service & Distribution	1.00	4,835	m2	\$47.85	\$231,367	
C2.2 Lighting, Devices & Heating	1.00	,		\$56.17	\$271,598	
C2.3 Systems & Ancillaries	1.00	4,835	m2	\$55.62	\$268,937	
D. SITE & ANCILLARY WORK						
D1 Site Work						\$310,819
D1.1 Site Development	1.00	,		\$52.95	,	
D1.3 Electrical Site Services	1.00	4,835	m2	\$11.34	\$54,820	
Z. GENERAL REQUIREMENTS & ALLOWANCES						
Z1 General Requirements & Fees						\$893,611
Z1.1 General Requirements	1.00	4,835	m2	\$127.35	\$615,727	
Z1.2 Fees	1.00	4,835	m2	\$57.47	\$277,884	
Z2 Allowances						\$1,880,846
Z2.1 Design Allowance	1.00	4,835	m2	\$299.23	\$1,446,790	
Z2.2 Escalation Allowance	1.00	,		Excluded		
Z2.3 Construction Allowance	1.00	4,835	m2	\$89.77	\$434,057	
Total				\$175	per sf	\$9,117,000

## ELEMENTAL SUMMARY CARBON COSTING STUDY - GENERIC WAREHOUSE BASE BUILDING



CLASS D ESTIMATE (Rev.1) NOVEMBER 22, 2018

					Location :	USL PEL IIIZ	ronto
				- 10	oronto		
Descript Element	tion t\Sub-Element	Ratio	Quantity	Unit	ental Cost Unit Rate	Sub Element	Element Total
A. SH	ELL						
A1 Sub	o-Structure						\$486,461
	1 Foundations	1.00	4,835	m2	\$100.61	\$486,461	<b>V</b> 100,101
A2. Stru		1.00	4,000	1112	\$100.01	φ400,401	£4.704.044
							\$1,724,941
	1 Lowest Floor Construction 3 Roof Construction	1.00 1.00	4,835 4,835	I	\$153.92 \$202.84	\$744,221 \$980,720	
A3. Ext	erior Enclosure						\$1,650,935
A3.3 A3.4	2 Walls Above Grade 3 Windows & Entrances 4 Roof Finish 5 Projections	0.25 0.02 1.00 1.00	1,230 119 4,835 4,835	m2 m2	\$428.69 \$1,161.34 \$190.71 \$13.10	\$527,290 \$138,200 \$922,095 \$63,350	
B. INT	ERIORS						
B1 Par	titions & Doors						\$127,675
	1 Partitions 2 Doors	1.00 0.01	4,835 32	m2 m2	\$20.47 \$896.88	\$98,975 \$28,700	
B2 Fini	ishes						\$87,094
B2.1	1 Floor Finishes	1.00	4,835	m2	\$12.99	\$62,830	
B2.2	2 Ceiling Finishes	1.00	4,835	I	\$3.77	\$18,220	
B2.3	3 Wall Finishes	1.00	4,835	m2	\$1.25	\$6,044	
B3 Fitti	ings & Equipment						\$166,180
	1 Fittings & Fixtures 2 Equipment	1.00 1.00	4,835 4,835		\$13.27 \$21.10	\$64,180 \$102,000	
C. SEI	RVICES						
C1 Med	chanical						\$1,026,606
C1.1	1 Plumbing & Drainage	1.00	4,835	m2	\$40.89	\$197,687	
C1.2	2 Fire Protection	1.00	4,835	m2	\$38.62	\$186,730	
	3 Heating, Ventilation, Air Cond.	1.00	4,835	I	\$109.24	\$528,164	
	4 Controls	1.00	4,835	m2	\$23.58	\$114,025	
C2 Elec							\$783,656
	1 Service & Distribution	1.00	4,835	I	\$48.58	\$234,890	
	2 Lighting, Devices & Heating 3 Systems & Ancillaries	1.00 1.00	4,835 4,835	I	\$57.03 \$56.47	\$275,734 \$273,033	
	E & ANCILLARY WORK	1.00	1,000		φου. 17	Ψ210,000	
D1 Site							\$312,067
	1 Site Development	4.00	4.005		<b>#</b> 50.40	<b>#057.007</b>	
	3 Electrical Site Services	1.00 1.00	4,835 4,835		\$53.16 \$11.38		
Z. GE	NERAL REQUIREMENTS		1,000		<b>\$11.00</b>	φοσ,σ το	
	neral Requirements & Fees						\$897,200
	General Requirements	1.00	4,835	m?	\$127.86	\$618,200	
	Prees	1.00	4,835 4,835	I	\$127.00 \$57.70		
Z2 Allo	owances						\$1,888,400
Z2.1	Design Allowance	1.00	4,835	m2	\$300.43	\$1,452,600	
	2 Escalation Allowance	1.00	4,835		Excluded		
Z2.3	3 Construction Allowance	1.00	4,835	m2	\$90.13	\$435,800	
Tota	al				\$176	per sf	\$9,151,000

## ELEMENTAL SUMMARY CARBON COSTING STUDY - GENERIC WAREHOUSE BASE BUILDING



CLASS D ESTIMATE (Rev.1) NOVEMBER 22, 2018

Gross Floor Area (m2) 4,835 Cost Per m2 1,854

				C	ost Per m2	1,854
				Location :	0	ttawa
			Elem	ental Cost		
Description Element\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A. SHELL						
A1. Sub-Structure						\$473,327
A1.1 Foundations	1.00	4,835	m2	\$97.90	\$473,327	
A2. Structure						\$1,690,442
A2.1 Lowest Floor Construction A2.3 Roof Construction	1.00 1.00	,		\$150.85 \$198.78	\$729,337 \$961,106	
A3. Exterior Enclosure						\$1,617,916
A3.2 Walls Above Grade A3.3 Windows & Entrances A3.4 Roof Finish A3.5 Projections	0.25 0.02 1.00 1.00	119 4,835	m2 m2	\$420.12 \$1,138.12 \$186.90 \$12.84	\$516,744 \$135,436 \$903,653 \$62,083	
B. INTERIORS						
B1 Partitions & Doors						\$125,122
B1.1 Partitions B1.2 Doors	1.00 0.01	· ·	m2 m2	\$20.06 \$878.94	\$96,996 \$28,126	
B2 Finishes						\$82,877
B2.1 Floor Finishes B2.2 Ceiling Finishes B2.3 Wall Finishes	1.00 1.00 1.00	· ·	m2	\$12.41 \$3.53 \$1.20	\$60,003 \$17,054 \$5,820	
B3 Fittings & Equipment						\$162,856
B3.1 Fittings & Fixtures B3.2 Equipment	1.00	,		\$13.01 \$20.67	\$62,896 \$99,960	
C. SERVICES						
C1 Mechanical						\$992,728
C1.1 Plumbing & Drainage C1.2 Fire Protection C1.3 Heating, Ventilation, Air Cond. C1.4 Controls	1.00 1.00 1.00 1.00	4,835 4,835	m2 m2	\$39.54 \$37.35 \$105.63 \$22.81	\$191,163 \$180,568 \$510,735 \$110,262	
C2 Electrical						\$782,873
C2.1 Service & Distribution C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries	1.00 1.00 1.00	4,835	m2	\$48.53 \$56.97 \$56.41	\$234,655 \$275,458 \$272,760	
D. SITE & ANCILLARY WORK						
D1 Site Work  D1.1 Site Development  D1.3 Electrical Site Services	1.00 1.00			\$52.10 \$11.16	. ,	
Z. GENERAL REQUIREMENTS & ALLOWANCES						
Z1 General Requirements & Fees						\$879,256
Z1.1 General Requirements Z1.2 Fees	1.00 1.00			\$125.30 \$56.55	\$605,836 \$273,420	
Z2 Allowances						\$1,850,632
Z2.1 Design Allowance Z2.2 Escalation Allowance	1.00	4,835	m2	\$294.43 Excluded		
Z2.3 Construction Allowance	1.00	4,835	m2	\$88.33	\$427,084	
Total				\$172	per sf	\$8,964,000

## ELEMENTAL SUMMARY CARBON COSTING STUDY - GENERIC WAREHOUSE BASE BUILDING

A.W. HOOKER <sup>®</sup>
QUANTITY SURVEYORS

CLASS D ESTIMATE (Rev.1) NOVEMBER 22, 2018

Gross Floor Area (m2)	4,835
Cost Per m2	1,801
Location: Me	ontreal
(-1.01	

					Mo	ontreal	
Doc	agrintian			Elem	ental Cost Unit	Sub	Element
	scription ment\Sub-Element	Ratio	Quantity	Unit	Rate	Element	Element Total
Α.	SHELL						
Α1	. Sub-Structure						\$473,327
	A1.1 Foundations	1.00	4,835	m2	\$97.90	\$473,327	
Α2	. Structure						\$1,650,769
	A2.1 Lowest Floor Construction A2.3 Roof Construction	1.00 1.00	4,835 4,835	I	\$147.31 \$194.12	\$712,220 \$938,549	
А3	Exterior Enclosure						\$1,579,945
R	A3.2 Walls Above Grade A3.3 Windows & Entrances A3.4 Roof Finish A3.5 Projections INTERIORS	0.25 0.02 1.00 1.00	1,230 119 4,835 4,835	m2 m2	\$410.26 \$1,111.41 \$182.51 \$12.54	\$504,617 \$132,257 \$882,445 \$60,626	
	Partitions & Doors						\$122,185
	B1.1 Partitions B1.2 Doors	1.00 0.01	4,835 32	m2 m2	\$19.59 \$858.31	\$94,719 \$27,466	\$122,100
В2	Finishes						\$87,516
	B2.1 Floor Finishes B2.2 Ceiling Finishes B2.3 Wall Finishes	1.00 1.00 1.00	4,835 4,835 4,835	m2	\$13.12 \$3.74 \$1.24	\$63,458 \$18,074 \$5,983	
ВЗ	Fittings & Equipment						\$159,034
	B3.1 Fittings & Fixtures B3.2 Equipment	1.00 1.00	4,835 4,835	I	\$12.70 \$20.19	\$61,420 \$97,614	
C.	SERVICES						
C1	Mechanical						\$951,664
	C1.1 Plumbing & Drainage C1.2 Fire Protection C1.3 Heating, Ventilation, Air Cond. C1.4 Controls	1.00 1.00 1.00 1.00	4,835 4,835 4,835 4,835	m2 m2	\$37.90 \$35.80 \$101.26 \$21.86	\$183,256 \$173,099 \$489,608 \$105,701	
C2	Electrical						\$720,964
	C2.1 Service & Distribution C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries	1.00 1.00 1.00	4,835 4,835 4,835	m2	\$44.69 \$52.47 \$51.95	\$216,099 \$253,675 \$251,190	
D.	SITE & ANCILLARY WORK						
D1	Site Work						\$298,648
	D1.1 Site Development D1.3 Electrical Site Services	1.00 1.00	4,835 4,835		\$50.87 \$10.89	\$245,975 \$52,674	
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$858,620
	Z1.1 General Requirements Z1.2 Fees	1.00 1.00	· ·	I	\$122.36 \$55.22	\$591,617 \$267,003	
Z2	Allowances						\$1,807,199
	Z2.1 Design Allowance Z2.2 Escalation Allowance Z2.3 Construction Allowance	1.00 1.00 1.00	4,835	m2	\$287.52 Excluded \$86.26	\$1,390,138 \$417,061	
	Total				\$167	per sf	\$8,710,000
Щ		<u> </u>			Ţ. <b></b>		

#### **ELEMENTAL SUMMARY CARBON COSTING STUDY - GENERIC** WAREHOUSE BASE BUILDING



CLASS D ESTIMATE (Rev.1) NOVEMBER 22, 2018

4,835 1.762 Gross Floor Area (m2) Cost Per m2

					С	ost Per m2	1,762
					Location :	H	alifax
Da	a a vin di a m			Elem	ental Cost	Sub	Flamout
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Element	Element Total
Α.	SHELL						
A1	. Sub-Structure						\$434,410
	A1.1 Foundations	1.00	4,835	m2	\$89.85	\$434,410	
Δ2	Structure	1.00	1,000		ψου.σσ	Ψ101,110	\$1,611,095
_	A2.1 Lowest Floor Construction	1.00	4,835	O	¢442.76	\$695,103	Ψ1,011,030
	A2.3 Roof Construction	1.00 1.00	,		\$143.76 \$189.45		
А3	Exterior Enclosure		,				\$1,541,973
	A3.2 Walls Above Grade	0.25	1,230	m2	\$400.40	\$492,489	
İ	A3.3 Windows & Entrances	0.02	,	m2	\$1,084.70		
į	A3.4 Roof Finish	1.00	4,835	m2	\$178.13	\$861,237	
	A3.5 Projections	1.00	4,835	m2	\$12.24	\$59,169	
В.	INTERIORS						
В1	Partitions & Doors						\$119,248
	B1.1 Partitions	1.00	4,835	m2	\$19.12	\$92,443	
	B1.2 Doors	0.01	32	m2	\$837.68	\$26,806	
В2	Finishes						\$79,246
	B2.1 Floor Finishes	1.00	4,835	m2	\$11.81	\$57,112	
	B2.2 Ceiling Finishes	1.00	4,835	m2	\$3.40	\$16,416	
	B2.3 Wall Finishes	1.00	4,835	m2	\$1.18	\$5,717	
ВЗ	Fittings & Equipment						\$155,212
	B3.1 Fittings & Fixtures	1.00	4,835	m2	\$12.40	\$59,944	
	B3.2 Equipment	1.00	4,835	m2	\$19.70	\$95,268	
C.	SERVICES						
C1	Mechanical						\$952,690
	C1.1 Plumbing & Drainage	1.00	4,835	m2	\$37.94	\$183,454	
	C1.2 Fire Protection	1.00	4,835	m2	\$35.84	\$173,285	
	C1.3 Heating, Ventilation, Air Cond.	1.00			\$101.37	\$490,136	
	C1.4 Controls	1.00	4,835	m2	\$21.89	\$105,815	
C2	Electrical						\$729,584
	C2.1 Service & Distribution	1.00		l	\$45.23		
	C2.2 Lighting, Devices & Heating	1.00	,		\$53.09		
	C2.3 Systems & Ancillaries	1.00	4,835	m2	\$52.57	\$254,193	
	SITE & ANCILLARY WORK						
D1	Site Work						\$291,471
	D1.1 Site Development	1.00	,		\$49.65		
	D1.3 Electrical Site Services	1.00	4,835	m2	\$10.63	\$51,408	
Z.	& ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$837,985
	Z1.1 General Requirements	1.00			\$119.42		
	Z1.2 Fees	1.00	4,835	m2	\$53.90	\$260,586	
Z2	Allowances						\$1,763,766
	Z2.1 Design Allowance	1.00	,		\$280.61		
	Z2.2 Escalation Allowance Z2.3 Construction Allowance	1.00 1.00			Excluded \$84.19		
	Total		1 ,,,,,,,,	<u> </u>			¢9 517 000
I	Total				\$164	per sf	\$8,517,000

#### **ELEMENTAL SUMMARY CARBON COSTING STUDY - GENERIC** WAREHOUSE BUILDING 100% CARBON REDUCTION



	ASS D ESTIMATE (Rev.1)				O Fl		4 205
NC	OVEMBER 22, 2018				Gross Floo	r Area (m2) ost Per m2	4,835 2,273
					Location :		couver
				Elem	ental Cost		
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A.	SHELL						
A1.	. Sub-Structure						\$465,543
	A1.1 Foundations	1.00	4,835	m2	\$96.29	\$465,543	
A2	Structure						\$1,647,319
	A2.1 Lowest Floor Construction	1.00	4,835	m2	\$147.00	\$710,731	. , ,
	A2.3 Roof Construction	1.00	4,835		\$193.71	\$936,588	
А3	Exterior Enclosure						\$1,690,455
	A3.2 Walls Above Grade	0.25	1,230	m2	\$409.40	\$503,562	
	A3.3 Windows & Entrances	0.02	119	m2	\$1,109.08	\$131,981	
	A3.4 Roof Finish	1.00	4,835		\$205.67	\$994,413	
_	A3.5 Projections	1.00	4,835	m2	\$12.51	\$60,499	
	INTERIORS						
B1	Partitions & Doors						\$121,930
	B1.1 Partitions	1.00	4,835		\$19.55	\$94,521	
	B1.2 Doors	0.01	32	m2	\$856.52	\$27,409	
B2	Finishes						\$90,337
	B2.1 Floor Finishes	1.00	4,835		\$14.00	\$67,668	
	B2.2 Ceiling Finishes B2.3 Wall Finishes	1.00 1.00	4,835 4,835		\$3.53 \$1.15	\$17,090 \$5,578	
ВЗ	Fittings & Equipment	1.00	4,000	1112	ψ1.13	ψ3,370	\$158,702
	•	4.00	4.005	0	¢40.00	#C4 000	\$130,702
	B3.1 Fittings & Fixtures B3.2 Equipment	1.00 1.00	4,835 4,835		\$12.68 \$20.15	\$61,292 \$97,410	
c	SERVICES		.,000		Ψ20.10	ψο,,σ	
	Mechanical						\$2,367,604
	C1.1 Plumbing & Drainage	4.00	4.005	0	¢40.70	¢400.070	\$2,367,604
	C1.2 Fire Protection	1.00 1.00	4,835 4,835		\$40.72 \$35.26	\$196,872 \$170,484	
	C1.3 Heating, Ventilation, Air Cond.	1.00	4,835		\$366.23	\$1,770,719	
	C1.4 Controls	1.00	4,835	m2	\$47.47	\$229,528	
C2	Electrical						\$758,795
	C2.1 Service & Distribution	1.00	4,835	m2	\$53.11	\$256,809	
	C2.2 Lighting, Devices & Heating	1.00	4,835		\$53.00	\$256,256	
	C2.3 Systems & Ancillaries	1.00	4,835	m2	\$50.82	\$245,729	
	SITE & ANCILLARY WORK						
D1	Site Work						\$298,024
	D1.1 Site Development	1.00	4,835		\$50.77	\$245,461	
7	D1.3 Electrical Site Services  GENERAL REQUIREMENTS	1.00	4,835	m2	\$10.87	\$52,564	
	& ALLOWANCES						
Z1	General Requirements & Fees						\$1,091,470
	Z1.1 General Requirements Z1.2 Fees	1.00 1.00	4,835 4,835		\$155.43 \$70.32	\$751,490 \$339,980	
<b>Z</b> 2	Allowances		.,550		Ţ, 0.3 <u>L</u>	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	\$2,297,635
	Z2.1 Design Allowance	1.00	4,835	m2	\$365.55	\$1,767,419	<del>+=,=31,000</del>
	Z2.2 Escalation Allowance	1.00	4,835		Excluded	ψ1,101,419	
	Z2.3 Construction Allowance	1.00	4,835		\$109.66	\$530,216	
	Total				\$211	per sf	\$10,988,000

#### **ELEMENTAL SUMMARY CARBON COSTING STUDY - GENERIC WAREHOUSE BUILDING 100% CARBON** REDUCTION



CLASS D ESTIMATE (Rev.1) NOVEMBER 22, 2018

Gross Floor Area (m2) 4,835

NC	OVEMBER 22, 2018				Gross Floo		4,835
						ost Per m2	2,396
				Elom	Location :	G	algary 
	scription ment\Sub-Element	Ratio	Quantity		Unit	Sub Element	Element Total
Α.	SHELL						
<b>A</b> 1	. Sub-Structure						\$510,784
	A1.1 Foundations	1.00	4,835	m2	\$105.64	\$510,784	, ,
A2	. Structure		.,		******	45.13,15.1	\$1,718,04°
	A2.1 Lowest Floor Construction	1.00	4,835	m2	\$153.31	\$741,244	<b>41,116,01</b>
	A2.3 Roof Construction	1.00	4,835		\$202.03	\$976,797	
А3	. Exterior Enclosure						\$1,763,030
	A3.2 Walls Above Grade	0.25	1,230	m2	\$426.98	\$525,181	
	A3.3 Windows & Entrances	0.02	· ·	m2	\$1,156.70		
	A3.4 Roof Finish	1.00	4,835	m2	\$214.50	\$1,037,105	
	A3.5 Projections	1.00	4,835	m2	\$13.05	\$63,097	
В.	INTERIORS						
В1	Partitions & Doors						\$127,164
	B1.1 Partitions	1.00	4,835	m2	\$20.39	\$98,579	
	B1.2 Doors	0.01	32	m2	\$893.29	\$28,585	
B2	Finishes						\$91,822
	B2.1 Floor Finishes	1.00	4,835	m2	\$13.71	\$66,286	
	B2.2 Ceiling Finishes	1.00	4,835	m2	\$3.93	\$19,022	
	B2.3 Wall Finishes	1.00	4,835	m2	\$1.35	\$6,515	
В3	Fittings & Equipment						\$165,51
	B3.1 Fittings & Fixtures	1.00	4,835		\$13.22	\$63,923	
	B3.2 Equipment	1.00	4,835	m2	\$21.01	\$101,592	
	SERVICES						
C1	Mechanical						\$2,530,977
	C1.1 Plumbing & Drainage	1.00	4,835		\$43.53	\$210,457	
	C1.2 Fire Protection	1.00	4,835		\$37.69	\$182,248	
	C1.3 Heating, Ventilation, Air Cond. C1.4 Controls	1.00 1.00	4,835 4,835		\$391.50 \$50.75	\$1,892,904 \$245,366	
C2	Electrical	1.00	1,000		\$00.70	Ψ2 10,000	\$830,459
_	C2.1 Service & Distribution	1.00	4 005	O	¢50.42	\$281,064	\$650,455
	C2.2 Lighting, Devices & Heating	1.00 1.00	4,835 4,835		\$58.13 \$58.01	\$280,458	
	C2.3 Systems & Ancillaries	1.00	4,835		\$55.62		
D.	SITE & ANCILLARY WORK						
D1	Site Work						\$310,819
	D1.1 Site Development	1.00	4,835	m2	\$52.95	\$255,999	
	D1.3 Electrical Site Services	1.00	4,835		\$11.34		
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$1,138,328
	Z1.1 General Requirements	1.00	4,835	m2	\$162.10	\$783,752	
	Z1.2 Fees	1.00	4,835	m2	\$73.34	\$354,576	
Z2	Allowances						\$2,396,276
	Z2.1 Design Allowance	1.00	4,835	m2	\$381.24	\$1,843,297	
	Z2.2 Escalation Allowance	1.00	4,835		Excluded		
_	Z2.3 Construction Allowance	1.00	4,835	m2	\$114.37	\$552,979	
	Total				\$223	per sf	\$11,583,000

#### **ELEMENTAL SUMMARY CARBON COSTING STUDY - GENERIC WAREHOUSE BUILDING 100% CARBON** REDUCTION



CLASS D ESTIMATE (Rev.1) NOVEMBER 22, 2018

Gross Floor Area (m2) 4,835 Cost Per m2 2,412

						ost Per m2	2,412
					Location:	To	oronto
				Elem	ental Cost		
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
	SHELL						
	. Sub-Structure						\$486,461
	A1.1 Foundations	1.00	4 005		£100 61	¢406.464	\$400,40
		1.00	4,835	m2	\$100.61	\$486,461	44 = 24 24
AZ	. Structure						\$1,724,941
	A2.1 Lowest Floor Construction A2.3 Roof Construction	1.00 1.00	,		\$153.92 \$202.84	\$744,221 \$980,720	
Α3	Exterior Enclosure						\$1,770,110
	A3.2 Walls Above Grade A3.3 Windows & Entrances A3.4 Roof Finish A3.5 Projections	0.25 0.02 1.00 1.00	119 4,835	m2 m2	\$428.69 \$1,161.34 \$215.36 \$13.10	\$527,290 \$138,200 \$1,041,270 \$63,350	
В.	INTERIORS						
В1	Partitions & Doors						\$127,675
	B1.1 Partitions B1.2 Doors	1.00 0.01	,	m2 m2	\$20.47 \$896.88	\$98,975 \$28,700	
B2	Finishes						\$87,094
	B2.1 Floor Finishes B2.2 Ceiling Finishes B2.3 Wall Finishes	1.00 1.00 1.00	4,835 4,835 4,835	m2	\$12.99 \$3.77 \$1.25	\$62,830 \$18,220 \$6,044	
ВЗ	Fittings & Equipment						\$166,180
	B3.1 Fittings & Fixtures B3.2 Equipment	1.00 1.00	4,835 4,835		\$13.27 \$21.10	\$64,180 \$102,000	
C.	SERVICES						
C1	Mechanical						\$2,593,214
	C1.1 Plumbing & Drainage C1.2 Fire Protection C1.3 Heating, Ventilation, Air Cond. C1.4 Controls	1.00 1.00 1.00 1.00	,	m2 m2	\$44.60 \$38.62 \$401.13 \$52.00	\$215,633 \$186,730 \$1,939,451 \$251,400	
C2	Electrical						\$843,106
	C2.1 Service & Distribution C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries	1.00 1.00 1.00	,	m2	\$59.02 \$58.89 \$56.47	\$285,344 \$284,729 \$273,033	
D.	SITE & ANCILLARY WORK						
D1	Site Work						\$312,067
	D1.1 Site Development D1.3 Electrical Site Services	1.00 1.00	,		\$53.16 \$11.38	\$257,027 \$55,040	
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$1,142,900
	Z1.1 General Requirements Z1.2 Fees	1.00 1.00	,		\$162.75 \$73.63	\$786,900 \$356,000	
Z2	Allowances						\$2,405,900
	Z2.1 Design Allowance Z2.2 Escalation Allowance	1.00 1.00	4,835	m2	\$382.77 Excluded	\$1,850,700	
	Z2.3 Construction Allowance	1.00	4,835	m2	\$114.83	\$555,200	
i	Total	1			\$224	per sf	\$11,660,000

# ELEMENTAL SUMMARY CARBON COSTING STUDY - GENERIC WAREHOUSE BUILDING 100% CARBON REDUCTION



CLASS D ESTIMATE (Rev.1) NOVEMBER 22, 2018

Gross Floor Area (m2) 4,835 Cost Per m2 2,358

IVC	OVEINIBER 22, 2016				Gioss Floor	ost Per m2	2,358
					Location :		ttawa
				Elem	ental Cost		
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
	SHELL						
A1.	. Sub-Structure						\$473,327
	A1.1 Foundations	1.00	4,835	m2	\$97.90	\$473,327	
A2	. Structure						\$1,690,442
	A2.1 Lowest Floor Construction	1.00	4,835	m2	\$150.85	\$729,337	
	A2.3 Roof Construction	1.00	4,835	m2	\$198.78	\$961,106	
А3	Exterior Enclosure						\$1,734,708
	A3.2 Walls Above Grade	0.25	1,230	m2	\$420.12	\$516,744	
	A3.3 Windows & Entrances	0.02		m2	\$1,138.12	-	
	A3.4 Roof Finish	1.00	4,835		\$211.05	\$1,020,445	
	A3.5 Projections	1.00	4,835	m2	\$12.84	\$62,083	
	INTERIORS						
B1	Partitions & Doors						\$125,122
	B1.1 Partitions B1.2 Doors	1.00	4,835		\$20.06	\$96,996	
L		0.01	32	m2	\$878.94	\$28,126	***
B2	Finishes						\$82,877
	B2.1 Floor Finishes B2.2 Ceiling Finishes	1.00 1.00	4,835		\$12.41	\$60,003	
	B2.3 Wall Finishes	1.00	4,835 4,835		\$3.53 \$1.20	\$17,054 \$5,820	
В3	Fittings & Equipment		.,		****	**,*=*	\$162,856
	B3.1 Fittings & Fixtures	1.00	4,835	m2	\$13.01	\$62,896	<b>\$102,000</b>
	B3.2 Equipment	1.00	4,835		\$20.67	\$99,960	
C.	SERVICES						
C1	Mechanical						\$2,507,638
	C1.1 Plumbing & Drainage	1.00	4,835	m2	\$43.13	\$208,517	
	C1.2 Fire Protection	1.00	4,835	m2	\$37.35	\$180,568	
	C1.3 Heating, Ventilation, Air Cond.	1.00	4,835		\$387.89	\$1,875,449	
	C1.4 Controls	1.00	4,835	m2	\$50.28	\$243,104	
C2	Electrical						\$842,263
	C2.1 Service & Distribution	1.00	4,835		\$58.96	\$285,058	
	C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries	1.00 1.00	4,835 4,835		\$58.83 \$56.41	\$284,445 \$272,760	
Ь	SITE & ANCILLARY WORK	1.00	1,000		ψου. 11	Ψ212,100	
	Site Work						\$305,826
٦'	D1.1 Site Development	4.00	4.005		<b>#50.40</b>	<b>#054.000</b>	
	D1.3 Electrical Site Services	1.00 1.00	4,835 4,835		\$52.10 \$11.16	\$251,886 \$53,940	
Z.	GENERAL REQUIREMENTS & ALLOWANCES		1,000		<b>Vo</b>	φοσ,σ το	
71	General Requirements & Fees						64 400 040
٦	•	4.00	4.00=		0450.50	ф <b>774</b> 400	\$1,120,042
	Z1.1 General Requirements Z1.2 Fees	1.00 1.00	l '		\$159.50 \$72.16	\$771,162 \$348,880	
<b>Z</b> 2	Allowances		.,530		Ţ. <u>2.</u> 10		\$2,357,782
	Z2.1 Design Allowance	1.00	4,835	m2	\$375.12	\$1,813,686	
	Z2.2 Escalation Allowance	1.00	· ·		Excluded	ψ1,013,000	
	Z2.3 Construction Allowance	1.00			\$112.53	\$544,096	
	Total			-	\$219	per sf	\$11,403,000
		<u> </u>			•	-	

# ELEMENTAL SUMMARY CARBON COSTING STUDY - GENERIC WAREHOUSE BUILDING 100% CARBON REDUCTION



CLASS D ESTIMATE (Rev.1) NOVEMBER 22, 2018

Gross Floor Area (m2) 4,835 Cost Per m2 2,288

						ost Per m2	2,288
					Location :	Mo	ontreal
				Elem	ental Cost		
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A.	SHELL						
<b>A</b> 1.	. Sub-Structure						\$473,327
	A1.1 Foundations	1.00	4,835	m2	\$97.90	\$473,327	
A2.	. Structure						\$1,650,769
	A2.1 Lowest Floor Construction A2.3 Roof Construction	1.00 1.00	4,835 4,835		\$147.31 \$194.12	\$712,220 \$938,549	
A3.	. Exterior Enclosure						\$1,693,995
	A3.2 Walls Above Grade A3.3 Windows & Entrances	0.25 0.02	1,230 119	m2 m2	\$410.26 \$1,111.41	\$504,617 \$132,257	
	A3.4 Roof Finish A3.5 Projections	1.00 1.00	4,835 4,835		\$206.10 \$12.54	\$996,495 \$60,626	
В.	INTERIORS						
В1	Partitions & Doors						\$122,185
	B1.1 Partitions B1.2 Doors	1.00 0.01	4,835 32	m2 m2	\$19.59 \$858.31	\$94,719 \$27,466	
B2	Finishes						\$87,516
	B2.1 Floor Finishes B2.2 Ceiling Finishes B2.3 Wall Finishes	1.00	4,835 4,835	m2	\$13.12 \$3.74	\$63,458 \$18,074	
D2		1.00	4,835	1112	\$1.24	\$5,983	0450.004
DJ	Fittings & Equipment						\$159,034
	B3.1 Fittings & Fixtures B3.2 Equipment	1.00 1.00	4,835 4,835		\$12.70 \$20.19	\$61,420 \$97,614	
C.	SERVICES						
C1	Mechanical						\$2,403,909
	C1.1 Plumbing & Drainage C1.2 Fire Protection C1.3 Heating, Ventilation, Air Cond. C1.4 Controls	1.00 1.00 1.00 1.00	4,835 4,835 4,835 4,835	m2 m2	\$41.34 \$35.80 \$371.85 \$48.20	\$199,891 \$173,099 \$1,797,871 \$233,048	
C2	Electrical		,			. ,	\$775,657
	C2.1 Service & Distribution C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries	1.00 1.00 1.00	4,835 4,835 4,835	m2	\$54.29 \$54.18 \$51.95	\$262,516 \$261,951 \$251,190	
D.	SITE & ANCILLARY WORK						
D1	Site Work						\$298,648
	D1.1 Site Development D1.3 Electrical Site Services	1.00 1.00	4,835 4,835		\$50.87 \$10.89	\$245,975 \$52,674	
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$1,093,755
	Z1.1 General Requirements Z1.2 Fees	1.00 1.00	4,835 4,835		\$155.75 \$70.46	\$753,063 \$340,692	
<b>Z</b> 2	Allowances						\$2,302,446
	Z2.1 Design Allowance Z2.2 Escalation Allowance	1.00 1.00	4,835 4,835		\$366.31 Excluded		
	Z2.3 Construction Allowance	1.00	4,835	m2	\$109.89	\$531,326	
	Total				\$213	per sf	\$11,061,000

#### **ELEMENTAL SUMMARY CARBON COSTING STUDY - GENERIC WAREHOUSE BUILDING 100% CARBON** REDUCTION



CLASS D ESTIMATE (Rev.1) NOVEMBER 22, 2018

4,835 Gross Floor Area (m2)

					C	ost Per m2	2,244
					Location:	H	alifax
D				Elem	ental Cost	Out	Flores
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A.	SHELL						
<b>A</b> 1.	. Sub-Structure						\$434,410
	A1.1 Foundations	1.00	4,835	m2	\$89.85	\$434,410	
A2.	. Structure						\$1,611,095
	A2.1 Lowest Floor Construction A2.3 Roof Construction	1.00 1.00	4,835 4,835		\$143.76 \$189.45	\$695,103 \$915,992	
A3.	. Exterior Enclosure						\$1,653,283
	A3.2 Walls Above Grade A3.3 Windows & Entrances A3.4 Roof Finish A3.5 Projections	0.25 0.02 1.00 1.00	1,230 119 4,835 4,835	m2 m2	\$400.40 \$1,084.70 \$201.15 \$12.24	\$129,079	
В.	INTERIORS						
В1	Partitions & Doors						\$119,248
	B1.1 Partitions B1.2 Doors	1.00 0.01	4,835 32	m2 m2	\$19.12 \$837.68	\$92,443 \$26,806	
B2	Finishes						\$79,246
	B2.1 Floor Finishes B2.2 Ceiling Finishes B2.3 Wall Finishes	1.00 1.00 1.00	4,835 4,835 4,835	m2	\$11.81 \$3.40 \$1.18	\$57,112 \$16,416 \$5,717	
В3	Fittings & Equipment		,			. ,	\$155,212
	B3.1 Fittings & Fixtures B3.2 Equipment	1.00 1.00	4,835 4,835		\$12.40 \$19.70	\$59,944 \$95,268	,
C.	SERVICES						
C1	Mechanical						\$2,406,502
	C1.1 Plumbing & Drainage C1.2 Fire Protection C1.3 Heating, Ventilation, Air Cond. C1.4 Controls	1.00 1.00 1.00 1.00	4,835 4,835 4,835 4,835	m2 m2	\$41.39 \$35.84 \$372.25 \$48.25	\$200,107 \$173,285 \$1,799,811 \$233,299	
C2	Electrical						\$784,931
	C2.1 Service & Distribution C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries	1.00 1.00 1.00	4,835 4,835 4,835	m2	\$54.94 \$54.83 \$52.57	\$265,655 \$265,083 \$254,193	
	SITE & ANCILLARY WORK						
D1	Site Work  D1.1 Site Development  D1.3 Electrical Site Services	1.00	4,835 4,835		\$49.65 \$10.63		
Z.	GENERAL REQUIREMENTS & ALLOWANCES	1.00	4,000	1112	ψ10.00	ψ31,400	
<b>Z</b> 1	General Requirements & Fees						\$1,067,469
	Z1.1 General Requirements Z1.2 Fees	1.00 1.00	4,835 4,835		\$152.01 \$68.77	\$734,965 \$332,504	
<b>Z</b> 2	Allowances						\$2,247,111
	Z2.1 Design Allowance Z2.2 Escalation Allowance	1.00	4,835	m2	\$357.51 Excluded		
	Z2.3 Construction Allowance	1.00	4,835	m2	\$107.25		040.000.000
	Total				\$208	per sf	\$10,850,000

#### **ELEMENTAL SUMMARY**

#### **CARBON COSTING STUDY - HIGH RISE MURB BASE BUILDING**



\$288 per sf

\$29,092,000

CLASS D ESTIMATE (Rev.3) NOVEMBER 22, 2018 Gross Floor Area (m2) 9.396 Cost Per m2 3,096 Location: Vancouver **Elemental Cost** Sub Unit Element Element\Sub-Element A. SHELL A1. Sub-Structure \$2,173,512 A1.1 Foundations 784 m2 \$2,591.84 \$2,032,004 0.08 A1.2 Basement Excavation 0.08 784 m2 \$180.50 \$141,508 A2. Structure \$3,738,167 A2.1 Lowest Floor Construction 0.08 784 m2 \$105.35 \$82,591 A2.2 Upper Floor Construction 0.92 8,613 m2 \$394.02 \$3,393,653 A2.3 Roof Construction 0.08 784 m2 \$334.08 \$261,922 A3. Exterior Enclosure \$2,492,795 A3.2 Walls Above Grade 3,547 m2 \$588.94 \$2,088,750 0.38 A3.3 Windows & Entrances 0.04 346 m2 \$685.53 \$237,270 A3.4 Roof Finish 0.08 784 m2 \$177.82 \$139,415 A3.5 Projections 1.00 9,396 m2 \$2.91 \$27,361 B. INTERIORS **B1 Partitions & Doors** \$2,483,161 **B1.1 Partitions** 11,361 m2 \$175.45 \$1,993,246 B1.2 Doors 0.15 1,377 m2 \$355.76 \$489,915 \$1,413,948 **B2** Finishes **B2.1 Floor Finishes** 9,241 m2 \$88.99 \$822,334 B2.2 Ceiling Finishes 0.98 9,241 m2 \$39.25 \$362,673 B2.3 Wall Finishes 16,129 m2 \$228,941 1.72 \$14.19 B3 Fittings & Equipment \$2,043,853 B3.1 Fittings & Fixtures 1.00 9,396 m2 \$92.28 \$867,102 **B3.3 Conveying Systems** 1.00 9,396 m2 \$125.24 \$1,176,751 C. SERVICES C1 Mechanical \$3,780,434 C1.1 Plumbing & Drainage 9,396 m2 \$182.53 \$1,715,051 C1.2 Fire Protection 1.00 9,396 m2 \$36.21 \$340,211 C1.3 Heating, Ventilation, Air Cond. 1.00 9,396 m2 \$172.86 \$1,624,161 C1.4 Controls 1.00 \$101,010 9,396 m2 \$10.75 C2 Electrical \$1,791,407 C2.1 Service & Distribution 1.00 9,396 m2 \$50.89 \$478,189 C2.2 Lighting, Devices & Heating 1.00 9,396 m2 \$49.33 \$463,487 C2.3 Systems & Ancillaries 1.00 9,396 m2 \$90.44 \$849,731 D. SITE & ANCILLARY WORK D1 Site Work \$79,376 D1.3 Electrical Site Services 1.00 9,396 m2 \$8.45 \$79,376 Z. GENERAL REQUIREMENTS & ALLOWANCES Z1 General Requirements & Fees \$3,066,410 Z1.1 General Requirements 1 00 9,396 m2 \$208.45 \$1,958,610 Z1.2 Fees 1.00 9,396 m2 \$117.90 \$1,107,800 **Z2** Allowances \$6,029,297 Z2.1 Design Allowance 9,396 m2 \$493.23 \$4,634,424 1.00 Z2.2 Escalation Allowance 1.00 9,396 m2 Excluded Z2.3 Construction Allowance 1.00 9,396 m2 \$148.45 \$1,394,873

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Total

## CARBON COSTING STUDY - HIGH RISE MURB BASE BUILDING



CLASS D ESTIMATE (Rev.3) NOVEMBER 22, 2018

Gross Floor Area (m2) 9,396 Cost Per m2 3,261

A2.1 Lowest Floor Construction   A2.2 Upper Floor Construction   A2.2 Upper Floor Construction   A2.3 Roof Construction   A2.3 Roof Construction   A2.3 Roof Construction   A3. Exterior Enclosure   A3.2 Walls Above Grade   A3.3 Windows & Entrances   A3.4 Walls Above Grade   A3.3 Windows & Entrances   A3.4 Roof Finish   A3.5 Projections   A3.5 Projectio							ost Per m2	3,261
Description   Part   Descrip						Location :	<u>C</u>	algary
Section   Color   Co					Elem			
A. SHELL  Al. Sub-Structure  Al. 1 Foundations Al. 2 Basement Excavation Al. 2 Basement Excavation Al. 2 Basement Excavation Al. 2 Basement Excavation Al. 2 Basement Excavation Al. 2 Structure  Al. 1 Lowest Floor Construction Al. 2 Structure Al. 1 Lowest Floor Construction Al. 2 Structure Al. 2 Structure Al. 2 Structure Al. 3 Roof Construction Al. 2 Structure Al. 3 Roof Construction Al. 2 Structure Al. 3 Roof Construction Al. 2 Structure Al. 4 Structure Al. 4 Structure Al. 5 Roof Construction Al. 6 Roof Construction Al. 7 Roof C								
A1. Sub-Structure  A1. Foundations A1. 2 Basement Excavation A1. 2 Basement Excavation A1. 2 Basement Excavation A1. 2 Basement Excavation A1. 2 Basement Excavation A1. 2 Basement Excavation A2. Structure  A2. 1 Lowest Floor Construction A2. 2 National Structure A2. 1 Lowest Floor Construction A2. 2 National Structure A2. 1 Lowest Floor Construction A2. 2 National Structure A2. 1 Lowest Floor Construction A2. 2 National Structure A2. 2 National Structure A3. 2 Walls Above Grade A3. 3 Windows & Entrances A3. 4 Roof Finish A3. 5 Projections A3. 4 Roof Finish A3. 5 Projections B1. NTERIORS B1 Partitions & Doors B1. 1 Partitions B1. 2 Doors B1. 1 Partitions B1. 2 Doors B1. 1 Partitions B1. 2 Doors B1. 1 Partitions B1. 2 Pinishes B2. 2 Celling Finishes B2. 2 Celling Finishes B2. 3 Walls Finishes B2. 3 Walls Finishes B2. 3 Walls Finishes B2. 3 Walls Finishes B2. 3 Walls Finishes B2. 3 Walls Finishes B2. 3 Walls Finishes B2. 4 Walls Finishes B2. 4 Walls Finishes B2. 5 Walls Finishes B2. 5 Walls Finishes B2. 5 Walls Finishes B2. 6 Walls Finishes B2. 6 Walls Finishes B2. 6 Walls Finishes B3. 3 Converying Systems B3. 3 Converying Systems B3. 3 Converying Systems B1. 00 9,396 m2 \$195.13 \$18.33.396 C2. 2 Walls Finishes C3. 4 Walls Finishes C4. 2 Walls Finishes C5. 5 Walls Finishes C6. 5 Walls Finishes C7. 5 Walls Finishes C8. 5 Walls Finishes C9. 9,396 m2 \$195.13 \$18.33.396 C9. 2 Walls Finishes C9. 5 Wall	Ele	ment\Sub-Element	Ratio	Quantity	Unit	Rate	Element	Total
A1.1 Foundations A1.2 Basement Excavation A2. Structure A2.1 Lowest Floor Construction A2.2 Upper Floor Construction A2.2 Upper Floor Construction A2.3 Roof Construction A2.3 Roof Construction A2.4 November Structure A3.4 Roof Floor Structure A3.5 Walls Above Grade A3.4 Nord Flinish A3.5 Projections A3.4 Roof Flinish A3.5 Projections B1.1 Partitions B1.1 Partitions B1.2 Doors B1.1 Partitions B2.2 Ceiling Flinishes B2.2 Ceiling Flinishes B2.2 Ceiling Flinishes B2.2 Ceiling Flinishes B2.3 Wall Flinishes B2.1 Flinishes B3.3 Conveying Systems C3.5 Service C3.5 Service C4.5 Service C5.5 Service C5.5 Service C6.1 Service C6.1 Service C7.1 Service & Distribution C7.2 Lighting, Devices & Heating C7.2 Service C8.5 Service C9.5 Service C9.5 Service C1.5 General Requirements C7.1 Service C7.1 Service C8.5 Service C9.5 Servi	A.	SHELL						
A1.1 Foundations A1.2 Basement Excavation A2. Structure A2.1 Lowest Floor Construction A2.2 Upper Floor Construction A2.2 Upper Floor Construction A2.3 Roof Construction A2.3 Roof Construction A2.3 Roof Construction A2.3 Roof Construction A2.3 Walls Above Grade A3.4 Windows & Entrances A3.4 Roof Finish A3.5 Projections B1.1 Partitions & Doors B1.1 Partitions & Doors B1.1 Partitions & Doors B1.2 Finishes B2.2 Finishes B2.2 Ceiling Finishes B2.2 Ceiling Finishes B2.3 Wall Finishes B2.3 Wall Finishes B2.3 Wall Finishes B2.3 Wall Finishes B2.3 Wall Finishes B2.3 Wall Finishes B3.3 Conveying Systems 1.00 9,396 m2 S19.3 S19.3 S27,316  S2,589,76:  S2,589,76: S1,776,89: S2,789,814 S2,899,814 S2,899,814 S2,899,814 S2,899,814 S2,899,814 S2,899,814 S2,899,814 S2,899,814 S2,899,814 S2,899,814 S2,899,814 S2,899,814 S2,899,814 S2,789,814 S2,789,814 S2,789,814 S2,789,814 S2,29,9,814 S2	A1	. Sub-Structure						\$2,377,055
A2. Structure  A2. Lowest Floor Construction A2. 2 Upper Floor Construction A2. 2 Upper Floor Construction A2. 2 Upper Floor Construction A2. 3 Roof Construction A3. Exterior Enclosure A3. Windows & Entrances A3. Windows &		A1.1 Foundations	0.00	704	0	<b>#0.040.74</b>	<b>#0.000.474</b>	<del>\$2,011,000</del>
A2. Structure  A2.1 Lowest Floor Construction A2.2 Upper Floor Construction A2.2 Upper Floor Construction A2.3 Roof Construction A2.3 Roof Construction A2.3 Roof Construction A2.3 Roof Construction A2.3 Roof Construction A3. Exterior Enclosure A3.2 Walls Above Grade A3.3 Windows & Entrances A3.4 Roof Finish A3.5 Projections A3.5 Projections B. INTERIORS B. INTERIORS B. INTERIORS B. INTERIORS B. Intractions B. I. Partitions & Doors B. I. Partitions & Doors B. I. Partitions B. I. 2 I. 11,361 m2 S182,98 \$2,078,819 B. 2 Colling Finishes B. 2.1 Floor Finishes B. 2.2 Celling Finishes B. 2.2 Celling Finishes B. 3.3 Conveying Systems D. 9, 996 m2 B. 3 Conveying Systems D. 9, 396 m2 B. 3 Conveying Systems D. 1.00 B. 3 Conveying Systems D. 1.00 B. 3 Conveying Systems D. 1.00 B. 3 Conveying Systems D. 1.00 B. 3 Conveying Systems D. 1.00 B. 3 Conveying Systems D. 2.2 Vall M2 B. 3 Conveying Systems D. 3 Conveying Syste								
A2.1 Lowest Floor Construction A2.2 Upper Floor Construction A2.2 Roof Construction A2.3 Roof Construction A2.3 Roof Construction A3. Exterior Enclosure  A3.2 Walls Above Grade A3.3 Windows & Entrances A3.4 Roof Flinish A3.5 Projections B1.1 Partitions B1.1 Partitions B1.2 Doors B1.1 Partitions B2.2 Ceiling Finishes B2.2 Floor Flinishes B2.2 Ceiling Finishes B2.2 Teiling & Equipment B3.1 Fittings & Equipment B3.1 Fittings & Equipment B3.1 Fittings & Extures B3.3 Conveying Systems C1.2 Fire Protection C1.2 Fire Protection C1.3 Heating, Ventilation, Air Cond. C1.4 Service & Distribution C2.2 Lighting, Devices & Heating C2.2 Systems & Ancillaties D. Stepson D. Steps			0.08	7 04	mz	\$100.24	\$147,563	
A2.2 Upper Floor Construction A2.3 Roof Construction A2.3 Roof Construction A2.3 Roof Construction A3. Exterior Enclosure A3.2 Walls Above Grade A3.3 Windows & Entrances A3.4 Roof Flinish A3.5 Projections A3.5 Projections A3.5 Projections A3.5 Projections A3.5 Projections A3.5 Projections A3.5 Projections A3.5 Projections A3.5 Projections A3.5 Projections A3.5 Projections B1.00 B1 Partitions & Doors B1.1 Partitions B1.2 I 11,361 m2 B1.2 Projections B1.1 Partitions B1.2 Projections B1.2 Projections B1.2 Projections B1.2 Projections B1.2 Projections B1.2 Projections B1.2 Projections B1.2 Projections B1.3 Projections B1.4 Partitions B1.5 Projections B1.6 Projections B1.7 Partitions B1.7 Projections B1.7 Projections B1.7 Projections B1.7 Projections B1.7 Projections B1.7 Projections B1.7 Projections B1.7 Projections B1.7 Projections B1.7 Projections B1.7 Projections B1.7 Projections B1.1 Projections B1.1 Projections B1.1 Projections B1.1 Projections B1.1 Projections B2.2 Celling Finishes B2.2 Celling Finishes B2.2 Celling Finishes B2.2 Celling Finishes B2.3 Conveying Systems B3.3 Conveying Systems B3.3 Conveying Systems B3.3 Conveying Systems B3.3 Conveying Systems B3.3 Conveying Systems B3.3 Conveying Systems B3.4 Projection B3.4	A2	. Structure						\$3,898,654
A2.3 Roof Construction  A3. Exterior Enclosure  A3.2 Walls Above Grade  A3.3 Windows & Entrances  A3.4 Roof Finish  0.08 784 m2 \$614.23 \$2,178,424  A3.3 Windows & Entrances  A3.4 Roof Finish  0.08 784 m2 \$185.46 \$145,400  A3.5 Projections  1.00 9,396 m2 \$3.04 \$28,535  B. INTERIORS  B1 Partitions & Doors  B1.1 Partitions  B1.2 Doors  B2.1 Floor Finishes  B2.1 Floor Finishes  B2.2 Ceiling Finishes  B2.2 Ceiling Finishes  B2.2 Walls Above Grade  A3.5 Windows & Entrances  A3.6 Projections  A3.6 Projections  1.21 11,361 m2 \$182.98 \$2,078,819  B1.2 Doors  B1.1 Partitions  B1.2 Doors  B1.2 Intigue  B2.1 Floor Finishes  B2.2 Finishes  B2.1 Floor Finishes  B2.2 Finishes  B2.1 Floor Finishes  B2.2 Finishes  B2.3 Wall Flinishes  B2.3 Wall Flinishes  B2.3 Wall Flinishes  B2.3 Wall Finishes  B3.5 Fittings & Equipment  B3.1 Fittings & Equipment  B3.1 Fittings & Fixtures  B3.3 Conveying Systems  1.00 9,396 m2 \$130.62 \$1227,271  C. SERVICES  C1 Mechanical  C1.1 Plumbing & Drainage  C1.2 Fire Protection  C1.3 Heating, Verhilation, Air Cond.  C1.4 Controls  C2.1 Service & Distribution  C2.2 Lighting, Devices & Heating  C2.3 Systems & Ancillaries  D. SITE & ANCILLARY WORK  D1 Site Work  D1.3 Electrical Site Services  Z1.1 General Requirements  X1.2 Fees  X2.1 Design Allowance  X2.1 Design Allowance  X2.1 Design Allowance  X2.1 Design Allowance  X2.1 Design Allowance  X2.2 Escalation Allowance  X2.3 Construction Allowance  X2.3 Construction Allowance  X2.3 Construction Allowance  X2.5 Construction Allowance  X2.5 Construction Allowance  X2.5 Construction Allowance  X2.5 Construction Allowance  X2.6 Construction Allowance  X2.7 Construction Allowance  X2.8 Construction Allowance  X2.9 Construction Allowance  X2.9 Construction Allowance  X2.1 Construction Allowance  X2.1 Construction Allowance  X2.2 Construction Allowance  X2.3 Construction Allowance  X2.5 Construction Allowance  X2.6 Construction Allowance  X2.7 Construction Allowance  X2.8 Construction Allowance  X2.8 Construction Allowance  X2.8 Construction Allowance  X2.8 Const		A2.1 Lowest Floor Construction	0.08	784	m2	\$109.87	\$86,137	
A3. Exterior Enclosure  A3.2 Walls Above Grade  A3.3 Windows & Entrances  A3.4 Roof Flinish  A3.5 Projections  B. INTERIORS  B. INTERIORS  B. IPartitions & 1.21		A2.2 Upper Floor Construction	0.92	8,613	m2	\$410.93	\$3,539,350	
A3.2 Walls Above Grade A3.3 Windows & Entrances A3.4 Roof Finish A3.5 Projections B. INTERIORS B1 Partitions & Doors B1.1 Partitions B1.2 Doors B2. Finishes B2.1 Floor Finishes B2.2 Ceiling Finishes B2.2 Ceiling Finishes B2.2 Ceiling Finishes B3.3 Conveying Systems B1.7 Fittings & Equipment B3.1 Fittings & Equipment B3.1 Fittings & Equipment B3.1 Fittings & Equipment C3.5 SerVICES C1 Mechanical C1.1 Plumbing & Drainage C1.2 Fire Protection C1.3 Heating, Verhilation, Air Cond. C1.4 Controls C2 Electrical C2.1 Service & Distribution C2.2 Services & Distribution C2.2 Services & Distribution C2.2 Services & Distribution C2.2 Services & D.00 D.306 m2 D.316 M2 D.326 m2 D.336 m2 D.336 m2 D.336 m2 D.336 m2 D.336 m2 D.336 m2 D.336 m2 D.336 m2 D.336 m2 D.3376 m2 D.3		A2.3 Roof Construction	0.08	784	m2	\$348.43	\$273,167	
A3.3 Windows & Entrances A3.4 Roof Finish A3.5 Projections B. INTERIORS B. INTERIORS B. INTERIORS B. IPartitions & Doors B. I.1 Partitions B. I.2 11,361 m2 \$182.98 \$2,078,819 \$12 Doors B. I.1 Partitions B. I.2 11,361 m2 \$182.98 \$2,078,819 \$12 Doors B. I.1 Partitions B. I.2 11,361 m2 \$182.98 \$2,078,819 \$12 Doors B. I.1 Partitions B. I.2 11,361 m2 \$182.98 \$2,078,819 \$12 Doors B. I.2 1 11,361 m2 \$182.98 \$2,078,819 \$12 Doors B. I.2 1 11,361 m2 \$182.98 \$2,078,819 \$12 Doors B. I.2 1 11,361 m2 \$182.98 \$2,078,819 \$12 Doors B. I.2 1 11,361 m2 \$182.98 \$2,078,819 \$10,948	А3	. Exterior Enclosure						\$2,599,816
A3.3 Windows & Entrances A3.4 Roof Finish A3.5 Projections B. INTERIORS B. INTERIORS B. INTERIORS B. IPartitions & Doors B. I.1 Partitions B. I.2 11,361 m2 \$182.98 \$2,078,819 \$12 Doors B. I.1 Partitions B. I.2 11,361 m2 \$182.98 \$2,078,819 \$12 Doors B. I.1 Partitions B. I.2 11,361 m2 \$182.98 \$2,078,819 \$12 Doors B. I.1 Partitions B. I.2 11,361 m2 \$182.98 \$2,078,819 \$12 Doors B. I.2 1 11,361 m2 \$182.98 \$2,078,819 \$12 Doors B. I.2 1 11,361 m2 \$182.98 \$2,078,819 \$12 Doors B. I.2 1 11,361 m2 \$182.98 \$2,078,819 \$12 Doors B. I.2 1 11,361 m2 \$182.98 \$2,078,819 \$10,948		A3 2 Walls Above Grade	0.38	3 5/17	m2	\$614.23	\$2 178 <i>1</i> 24	
A3.4 Roof Finish A3.5 Projections B. INTERIORS B. INTERIORS B. Interiors B. Interio				-		•		
A3.5 Projections						•		
B. INTERIORS   B1 Partitions & Doors   B1.1 Partitions & Doors   B1.2 poors   D.15   1,377 m2   \$371.04   \$510.948   B2 Finishes   D.98   9.241 m2   \$87.17   \$805.536   \$82.2 Celling Finishes   D.98   9.241 m2   \$43.68   \$403.657   \$82.3 Wall Finishes   D.98   9.241 m2   \$16.58   \$267.387   \$811.99 m2   \$16.58   \$267.387   \$83.71   \$805.536   \$82.3 Wall Finishes   D.98   9.241 m2   \$16.58   \$267.387   \$83.7   \$805.536   \$82.3 Wall Finishes   D.98   9.241 m2   \$16.58   \$403.657   \$82.3 Wall Finishes   D.98   9.241 m2   \$16.58   \$267.387   \$83.7   \$11.00   9.396 m2   \$130.62   \$1.227.271   \$1.00   9.396 m2   \$130.62   \$1.227.271   \$1.00   9.396 m2   \$130.62   \$1.227.271   \$1.00								
B1   Partitions & Doors   B1.1   Partitions   B1.2   Doors   D.15   1,377   m2   \$371.04   \$510.948   B2.2   Doors   D.15   1,377   m2   \$371.04   \$510.948   B2.2   Florishes   B2.2   Ceiling Finishes   D.98   9,241   m2   \$43.68   \$403.657   B2.3   Wall Finishes   D.98   9,241   m2   \$43.68   \$403.657   B2.3   Wall Finishes   D.98   9,241   m2   \$43.68   \$403.657   B2.3   Wall Finishes   D.98   9,241   m2   \$43.68   \$403.657   B2.3   Wall Finishes   D.98   9,241   m2   \$43.68   \$403.657   B2.3   Wall Finishes   D.98   9,241   m2   \$43.68   \$403.657   B2.3   Wall Finishes   D.98   P.241   m2   \$43.68   \$403.657   B2.3   Wall Finishes   D.98   P.241   m2   \$43.68   \$403.657   B2.3   Wall Finishes   D.98   M2   \$16.58   \$267,387   B3.3   Fittings & Equipment   D.00   9,396   m2   \$130.62   \$1,227,271   D.00   P.396   m2   \$130.62   \$1,227,271   D.00   P.396   m2   \$130.62   \$1,227,271   D.00   P.396   m2   \$130.62   \$1,227,271   D.00   P.396   m2   \$1,227,271   D.00   P.396   m2   \$1,227,271   D.00   P.396   m2	L	•		2,230	-	, , , ,	,.00	
B1.1 Partitions								
B1.2 Doors	B <sub>1</sub>	Partitions & Doors						\$2,589,767
Section   Sect		B1.1 Partitions	1.21	11,361	m2	\$182.98	\$2,078,819	
B2.1 Floor Finishes B2.2 Ceiling Finishes B2.2 Ceiling Finishes B2.3 Wall Finishes B3.3 Wall Finishes B3.4 Fittings & Equipment B3.1 Fittings & Fixtures B3.3 Conveying Systems B3.3 Conveying Systems B3.4 Fittings & Fixtures B3.3 Conveying Systems B3.4 Fittings & Fixtures B3.4 Fittings & Fixtures B3.4 Fittings & Fixtures B3.5 Conveying Systems B3.5 Conveying Systems B3.6 Conveying Systems B3.6 Conveying Systems B3.6 Conveying Systems B3.6 Conveying Systems B3.6 Conveying Systems B3.6 Conveying Systems B3.6 Conveying Systems B3.6 Conveying Systems B3.6 Conveying Systems B3.6 Conveying Systems B3.7 Fittings & Fixtures B3.8 Fittings & Fixtures B3.9 Fixtures B3.9 Fixtures B3.1 Fittings & Fixtures B3.2 Fixtures B3.3 Conveying Systems B3.4 Fixtures B3.4 Fixtures B3.4 Fixtures B3.4 Systems & Systems & Systems B3.4 Fixtures B		B1.2 Doors	0.15	1,377	m2	\$371.04	\$510,948	
B2.2 Celling Finishes B2.3 Wall Finishes B2.3 Wall Finishes B2.3 Wall Finishes B2.3 Wall Finishes B3.4 Fittings & Equipment B3.1 Fittings & Fixtures B3.3 Conveying Systems B3.3 Conveying Systems B3.4 Fixtures B3.5 Conveying Systems B3.5 Conveying Systems B3.6 Fixtures B3.6 Fixtures B3.6 Fixtures B3.7 Fixtures B3.6 Fixtures B3.7 Fixtures B3.8 Fixtures B3.9 Fixtures B3.9 Fixtures B3.9 Fixtures B3.1 Fittings & Fixtures B3.2 Fixtures B3.3 Conveying Systems B3.4 Fixtures B3.4 Fixtures B3.5 Fixtures B3.6 Fixtures B3.6 Fixtures B3.6 Fixtures B3.6 Fixtures B3.6 Fixtures B3.6 Fixtures B3.7 Fixtures B3.6 Fi	B2	Finishes						\$1,476,581
B2.2 Celling Finishes B2.3 Wall Finishes B2.3 Wall Finishes B2.3 Wall Finishes B2.3 Wall Finishes B3.4 Fittings & Equipment B3.1 Fittings & Fixtures B3.3 Conveying Systems B3.3 Conveying Systems B3.4 Fixtures B3.5 Conveying Systems B3.5 Conveying Systems B3.6 Fixtures B3.6 Fixtures B3.6 Fixtures B3.7 Fixtures B3.6 Fixtures B3.7 Fixtures B3.8 Fixtures B3.9 Fixtures B3.9 Fixtures B3.9 Fixtures B3.1 Fittings & Fixtures B3.2 Fixtures B3.3 Conveying Systems B3.4 Fixtures B3.4 Fixtures B3.5 Fixtures B3.6 Fixtures B3.6 Fixtures B3.6 Fixtures B3.6 Fixtures B3.6 Fixtures B3.6 Fixtures B3.7 Fixtures B3.6 Fi		R2 1 Floor Finishes	0.08	0.241	m2	¢97.17	¢205 536	
B2.3 Wall Finishes				,		•	-	
B3 Fittings & Equipment   B3.1 Fittings & Fixtures   B3.3 Conveying Systems   1.00   9,396   m2   \$130.62   \$1,227,271		•		-			-	
B3.1 Fittings & Fixtures B3.3 Conveying Systems  1.00 9,396 m2 \$130.62 \$1,227,271  C. SERVICES  C1 Mechanical C1.1 Plumbing & Drainage C1.2 Fire Protection C1.3 Heating, Ventilation, Air Cond. C1.4 Controls C2 Electrical C2.1 Service & Distribution C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries C3. Systems & Ancillaries C3. Systems & Ancillaries C4. General Requirements & Fees Z1.1 General Requirements & Fees Z1.2 Fees Z2. Allowances Z2.1 Design Allowance Z2.2 Escalation Allowance Z2.2 Escalation Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.4 Construction Allowance Z2.5 Construction Allowance Z2.6 Construction Allowance Z2.7 Cons	L		1.72	10,120		ψ10.00	Ψ201,001	
B3.3 Conveying Systems	В	Fittings & Equipment						\$2,131,599
C. SERVICES C1 Mechanical C1.1 Plumbing & Drainage C1.2 Fire Protection C1.3 Heating, Ventilation, Air Cond. C1.4 Controls C2 Electrical C2.1 Service & Distribution C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries C3. Systems & Ancillaries C3. Site Work D1.3 Electrical Site Services Z1 General Requirements & Fees Z1.1 General Requirements & Fees Z1.2 Fees Z2.1 Design Allowance Z2.2 Lighting Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.4 Service & Distribution C3.5 Service & Distribution C4.7 Site Work C5.5 Service & Distribution C5.6 Service & Distribution C6.7 Site Work C7.6 Service & Distribution C7.7 Site Work C8.7 Service & Distribution C9.396 m2 C9		B3.1 Fittings & Fixtures	1.00	9,396	m2	\$96.25	\$904,328	
C1 Mechanical  C1.1 Plumbing & Drainage C1.2 Fire Protection C1.3 Heating, Ventilation, Air Cond. C1.4 Controls  C2.1 Service & Distribution C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries  D. SITE & ANCILLARY WORK D1 Site Work D1.3 Electrical Site Services Z1.1 General Requirements & Fees Z1.1 General Requirements & Fees Z1.2 Fees  Z2.1 Design Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z1.00 9,396 m2 S19.513 \$1,833,396 S1,833,398 S1,833,396 S1,834,784 S1,936,367 S1,836,367 S1,833,396 S1,836,367 S1,833,396 S1,836,367 S1,833,396 S1,836,367 S1,833,396 S1,836,367 S1,833,396 S1,836,367 S1,833,396 S1,836,367 S1,833,396 S1,836,367 S1,833,396 S1,836,367 S1,833,396 S1,836,367 S1,833,396 S1,836,367 S1,833,396 S1,836,367 S1,833,396 S1,836,367 S1,833,396 S1,836,367 S1,833,396 S1,836,367 S1,833,396		B3.3 Conveying Systems	1.00	9,396	m2	\$130.62	\$1,227,271	
C1.1 Plumbing & Drainage C1.2 Fire Protection C1.3 Heating, Ventilation, Air Cond. C1.4 Controls C2 Electrical C2.1 Service & Distribution C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries C3.3 Systems & Ancillaries C4.5 Site Work C5.4 General Requirements & Fees C5.5 General Requirements & Fees C7.1 General Requirements & Fees C7.1 General Requirements C7.1 General Requirements C7.2 Allowances C7.3 Construction Allowance C7.4 Controls C8.5 Fix Protection C9.3 Systems & Ancillaries C9.3 Systems & Ancillaries C9.4 Service & Distribution C9.3 Systems & Ancillaries C9.3 Systems & Ancillaries C9.4 Service & Distribution C9.3 Systems & Ancillaries C9.3 Systems & Ancillaries C9.4 Service & Distribution C9.3 Systems & Security C9.3 Systems & Security C9.3 Systems & Ancillaries C9.3 Systems & Ancillaries C9.3 Systems & Security C9.3	C.	SERVICES						
C1.1 Plumbing & Drainage C1.2 Fire Protection C1.3 Heating, Ventilation, Air Cond. C1.4 Controls C2 Electrical C2.1 Service & Distribution C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries C3.3 Systems & Ancillaries C4.5 Site Work C5.4 General Requirements & Fees C5.5 General Requirements & Fees C7.1 General Requirements & Fees C7.1 General Requirements C7.1 General Requirements C7.2 Allowances C7.3 Construction Allowance C7.4 Controls C8.5 Fix Protection C9.3 Systems & Ancillaries C9.3 Systems & Ancillaries C9.4 Service & Distribution C9.3 Systems & Ancillaries C9.3 Systems & Ancillaries C9.4 Service & Distribution C9.3 Systems & Ancillaries C9.3 Systems & Ancillaries C9.4 Service & Distribution C9.3 Systems & Security C9.3 Systems & Security C9.3 Systems & Ancillaries C9.3 Systems & Ancillaries C9.3 Systems & Security C9.3	C1	Mechanical						\$4 041 296
C1.2 Fire Protection       1.00       9,396       m2       \$38.71       \$363,687         C1.3 Heating, Ventilation, Air Cond.       1.00       9,396       m2       \$184.78       \$1,736,234         C1.4 Controls       1.00       9,396       m2       \$11.49       \$107,980         C2 Electrical       \$1,960,594       \$1,960,594       \$1,960,594         C2.1 Service & Distribution       1.00       9,396       m2       \$55.70       \$523,352         C2.2 Lighting, Devices & Heating       1.00       9,396       m2       \$53.99       \$507,261         C2.3 Systems & Ancillaries       1.00       9,396       m2       \$98.98       \$929,983         D. SITE & ANCILLARY WORK       39,396       m2       \$8.81       \$82,784         Z. GENERAL REQUIREMENTS & ALLOWANCES       1.00       9,396       m2       \$217.40       \$2,042,696         Z1.1 General Requirements & Fees       1.00       9,396       m2       \$1,155,360         Z2 Allowances       1.00       9,396       m2       \$514.41       \$4,833,389         Z2.2 Escalation Allowance       1.00       9,396       m2       \$514.41       \$4,833,389         Z2.3 Construction Allowance       1.00       9,396       m2			4.00	0.000	0	#40F 40	<b>#4 000 000</b>	
C1.3 Heating, Ventilation, Air Cond. C1.4 Controls  C2 Electrical  C2.1 Service & Distribution C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries  D. SITE & ANCILLARY WORK D1.3 Electrical Site Services  Z1.1 General Requirements & Fees Z1.1 General Requirements Z2.1 Design Allowance Z2.2 Lighous Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance Z2.3 Construction Allowance  C2.4 Service & D1.00 D 9,396 m2 D 9,396 m2 D 9,396 m2 S55.70 S523,352 S523,352 S523,352 S523,352 S523,352 S53.99 S507,261 S53.99 S507,261 S53.99 S507,261 S53.99 S507,261 S53.99 S507,261 S53.99 S507,261 S53.99 S507,261 S53.99 S507,261 S53.99 S507,261 S53.99 S507,261 S53.99 S507,261 S53.99 S507,261 S53.99 S507,261 S523,352				-		•		
C1.4 Controls       1.00       9,396 m2       \$11.49       \$107,980         C2 Electrical       \$1,960,596       \$1,960,596         C2.1 Service & Distribution       1.00       9,396 m2       \$55.70       \$523,352         C2.2 Lighting, Devices & Heating       1.00       9,396 m2       \$53.99       \$507,261         C2.3 Systems & Ancillaries       1.00       9,396 m2       \$98.98       \$929,983         D. SITE & ANCILLARY WORK       \$82,784         D1.3 Electrical Site Services       1.00       9,396 m2       \$8.81       \$82,784         Z. GENERAL REQUIREMENTS & ALLOWANCES       1.00       9,396 m2       \$217.40       \$2,042,696         Z1.1 General Requirements Z1.2 Fees       1.00       9,396 m2       \$122.96       \$1,155,360         Z2 Allowances       1.00       9,396 m2       \$514.41       \$4,833,389         Z2.2 Escalation Allowance       1.00       9,396 m2       Excluded         Z2.3 Construction Allowance       1.00       9,396 m2       \$154.83       \$1,454,758				-		•	-	
C2 Electrical  C2.1 Service & Distribution C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries  D. SITE & ANCILLARY WORK D1 Site Work D1.3 Electrical Site Services  Z1 General Requirements & Fees Z1.1 General Requirements Z1.2 Fees  Z2.4 Lighting, Devices & Heating D1.00 D1		•		· ·				
C2.1 Service & Distribution C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries C2.3 Systems & Ancillaries C2.4 Service & Distribution C2.5 Systems & Ancillaries C2.5 Systems & Ancillaries C2.6 Systems & Ancillaries C2.7 Systems & Ancillaries C2.8 Systems & Ancillaries C2.9 Systems & Ancillaries C2.9 Systems & Ancillaries C2.9 Systems & Ancillaries C2.9 Systems & Ancillaries C2.9 Systems & Ancillaries C2.9 Systems & Ancillaries C2.9 Systems & Ancillaries C2.9 Systems & Syst			1.00	9,090	1112	ψ11. <del>4</del> 9	Ψ101,300	
C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries  D. SITE & ANCILLARY WORK D1 Site Work D1.3 Electrical Site Services  Z1 General Requirements & Fees Z1.1 General Requirements Z1.2 Fees  Z2.4 Lighting, Devices & Heating D1.00 D1.	JC2							\$1,960,596
C2.3 Systems & Ancillaries       1.00       9,396 m2       \$98.98       \$929,983         D. SITE & ANCILLARY WORK       9,396 m2       \$8.81       \$82,784         D1.3 Electrical Site Services       1.00       9,396 m2       \$8.81       \$82,784         Z. GENERAL REQUIREMENTS & ALLOWANCES       \$3,198,056         Z1.1 General Requirements & Fees       1.00       9,396 m2       \$217.40       \$2,042,696 s1,155,360         Z1.2 Fees       1.00       9,396 m2       \$122.96       \$1,155,360         Z2 Allowances       \$6,288,146         Z2.1 Design Allowance       1.00       9,396 m2       \$514.41       \$4,833,389         Z2.2 Escalation Allowance       1.00       9,396 m2       Excluded         Z2.3 Construction Allowance       1.00       9,396 m2       \$154.83       \$1,454,758				,			-	
D. SITE & ANCILLARY WORK D1 Site Work D1.3 Electrical Site Services D1.3 Electrical Site Services D1.3 Electrical Site Services D1.3 Electrical Site Services D1.3 Electrical Site Services D1.3 Electrical Site Services D1.00 9,396 m2 \$8.81 \$82,784  Z1 General Requirements & Fees Z1.1 General Requirements Z1.2 Fees D1.00 9,396 m2 \$217.40 \$2,042,696 \$1,155,360  Z2 Allowances Z2.1 Design Allowance Z2.1 Design Allowance D1.00 9,396 m2 \$514.41 \$4,833,389 Excluded Z2.2 Escalation Allowance D1.00 9,396 m2 Excluded D1.00 9,396 m2 \$154.83 \$1,454,758		•				1		
D1 Site Work  D1.3 Electrical Site Services  1.00 9,396 m2 \$8.81 \$82,784  Z. GENERAL REQUIREMENTS & ALLOWANCES  Z1 General Requirements \$1.00 9,396 m2 \$217.40 \$2,042,696 \$1,155,360  Z1.2 Fees \$1.00 9,396 m2 \$122.96 \$1,155,360  Z2 Allowances  Z2.1 Design Allowance \$2.2 Escalation Allowance \$1.00 9,396 m2 Excluded \$2.3 Construction Allowance \$1.00 9,396 m2 \$154.83 \$1,454,758		C2.3 Systems & Ancillaries	1.00	9,396	m2	\$98.98	\$929,983	
D1.3 Electrical Site Services  Z. GENERAL REQUIREMENTS & ALLOWANCES  Z1 General Requirements & Fees  Z1.1 General Requirements  Z1.2 Fees  Z1.2 Fees  Z2.1 Design Allowance  Z2.2 Escalation Allowance  Z2.3 Construction Allowance  Z2.3 Construction Allowance  Z3.4 Services  1.00  9,396  m2  \$8.81  \$82,784  \$3,198,056  \$3,198,056  \$21.2 \$217.40  \$2,042,696  m2  \$1,155,360  \$4,283,146  \$4,833,389  Excluded  Z2.2 Escalation Allowance  1.00  9,396  m2  \$514.41  \$4,833,389  Excluded  Z2.3 Construction Allowance  1.00  9,396  m2  \$1,454,758	D.	SITE & ANCILLARY WORK						
D1.3 Electrical Site Services  Z. GENERAL REQUIREMENTS & ALLOWANCES  Z1 General Requirements & Fees  Z1.1 General Requirements  Z1.2 Fees  Z1.2 Fees  Z2.1 Design Allowance  Z2.2 Escalation Allowance  Z2.3 Construction Allowance  Z2.3 Construction Allowance  Z2.4 Services  1.00  9,396  m2  9,396  m2  \$88.81  \$82,784  \$33,198,056  \$217.40  \$2,042,696  \$1,155,360  \$21,155,360  \$22 Allowances  \$22.1 Design Allowance  1.00  9,396  m2  \$514.41  \$4,833,389  Excluded  Z2.3 Construction Allowance  1.00  9,396  m2  \$154.83  \$1,454,758	D1	Site Work						\$82,784
Z. GENERAL REQUIREMENTS & ALLOWANCES       \$ 3,198,056         Z1 General Requirements & Fees       \$ 217.40       \$ 2,042,696         Z1.2 Fees       1.00       9,396 m2       \$ 122.96       \$ 1,155,360         Z2 Allowances       \$ 21 Design Allowance       \$ 3,498,056       \$ 22,042,696       \$ 3,198,056         Z2 Allowances       \$ 1.00       9,396 m2       \$ 122.96       \$ 1,155,360         Z2.1 Design Allowance       1.00       9,396 m2       \$ 514.41       \$ 4,833,389         Z2.2 Escalation Allowance       1.00       9,396 m2       Excluded         Z2.3 Construction Allowance       1.00       9,396 m2       \$ 154.83       \$ 1,454,758		D1.3 Electrical Site Services	1.00	0 306	m2	¢Ω Ω1	\$22 724	
& ALLOWANCES         Z1 General Requirements & Fees       \$3,198,056         Z1.1 General Requirements       1.00       9,396 m2       \$217.40       \$2,042,696         Z1.2 Fees       1.00       9,396 m2       \$122.96       \$1,155,360         Z2 Allowances       \$6,288,146         Z2.1 Design Allowance       1.00       9,396 m2       \$514.41       \$4,833,389         Z2.2 Escalation Allowance       1.00       9,396 m2       Excluded         Z2.3 Construction Allowance       1.00       9,396 m2       \$154.83       \$1,454,758	L		1.00	9,390	1112	φο.δ1	φ0∠,104	
Z1.1 General Requirements       1.00       9,396 m2       \$217.40       \$2,042,696 st.155,360         Z1.2 Fees       1.00       9,396 m2       \$122.96       \$1,155,360         Z2 Allowances       \$6,288,140         Z2.1 Design Allowance       1.00       9,396 m2       \$514.41       \$4,833,389         Z2.2 Escalation Allowance       1.00       9,396 m2       Excluded         Z2.3 Construction Allowance       1.00       9,396 m2       \$154.83       \$1,454,758	Z.							
Z1.2 Fees       1.00       9,396 m2       \$122.96       \$1,155,360         Z2 Allowances       \$6,288,146         Z2.1 Design Allowance       1.00       9,396 m2       \$514.41       \$4,833,389         Z2.2 Escalation Allowance       1.00       9,396 m2       Excluded         Z2.3 Construction Allowance       1.00       9,396 m2       \$154.83       \$1,454,758	<b>Z</b> 1	General Requirements & Fees						\$3,198,056
Z1.2 Fees       1.00       9,396 m2       \$122.96       \$1,155,360         Z2 Allowances       \$6,288,146         Z2.1 Design Allowance       1.00       9,396 m2       \$514.41       \$4,833,389         Z2.2 Escalation Allowance       1.00       9,396 m2       Excluded         Z2.3 Construction Allowance       1.00       9,396 m2       \$154.83       \$1,454,758		Z1.1 General Requirements	1.00	9,396	m2	\$217.40	\$2,042,696	
Z2.1 Design Allowance       1.00       9,396 m2       \$514.41       \$4,833,389         Z2.2 Escalation Allowance       1.00       9,396 m2       Excluded         Z2.3 Construction Allowance       1.00       9,396 m2       \$154.83       \$1,454,758		·						
Z2.1 Design Allowance       1.00       9,396 m2       \$514.41       \$4,833,389         Z2.2 Escalation Allowance       1.00       9,396 m2       Excluded         Z2.3 Construction Allowance       1.00       9,396 m2       \$154.83       \$1,454,758	Z2	Allowances						\$6 288 146
Z2.2 Escalation Allowance       1.00       9,396 m2       Excluded         Z2.3 Construction Allowance       1.00       9,396 m2       \$154.83       \$1,454,758	Γ			2 25 -	_	*=	04.000.000	
Z2.3 Construction Allowance 1.00 9,396 m2 \$154.83 \$1,454,758		•		-			\$4,833,389	
1.60 5,600 1.10 7.10 7.10 7.10 7.10 7.10 7.10 7.							¢1 /E/ 750	
Total \$303 per sf \$30,644,000		22.3 Construction Allowance	1.00	9,396	mz	\$154.83	ъ 1,454,758	
		Total				\$303	per sf	\$30,644,000

#### **ELEMENTAL SUMMARY**

### CARBON COSTING STUDY - HIGH RISE MURB BASE BUILDING



CLASS D ESTIMATE (Rev.3) NOVEMBER 22, 2018

Gross Floor Area (m2) 9,396
Cost Per m2 3,264

					Location :	ost Per IIIZ	oronto
				Elem	ental Cost		
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A.	SHELL						
Α1	. Sub-Structure						\$2,271,482
	A1.1 Foundations	0.08	784	m2	\$2,708.30	\$2,123,306	
	A1.2 Basement Excavation	0.08	784	m2	\$189.00	\$148,176	
A2	. Structure						\$3,914,311
	A2.1 Lowest Floor Construction	0.08	784	m2	\$110.31	\$86,483	
	A2.2 Upper Floor Construction	0.92	8,613		\$412.58	\$3,553,564	
	A2.3 Roof Construction	0.08	784	m2	\$349.83	\$274,264	
А3	. Exterior Enclosure						\$2,610,257
	A3.2 Walls Above Grade	0.38	3,547		\$616.70	\$2,187,173	
	A3.3 Windows & Entrances A3.4 Roof Finish	0.04 0.08		m2 m2	\$717.84	\$248,450	
	A3.5 Projections	1.00	9,396		\$186.20 \$3.05	\$145,984 \$28,650	
В	INTERIORS		,,,,,		******	<del>,</del>	
	Partitions & Doors						\$2,600,168
Γ.	B1.1 Partitions	1.21	11,361	m?	\$183.72	\$2,087,168	Ψ2,000,100
	B1.2 Doors	0.15			\$372.53	\$513,000	
B2	Finishes		.,		***	70.0,000	\$1,398,227
I	B2.1 Floor Finishes	0.98	9,241	m2	\$82.62	\$763,542	ψ1,000, <u>12</u> 1
	B2.2 Ceiling Finishes	0.98	9,241		\$41.84	\$386,645	
	B2.3 Wall Finishes	1.72	16,129	m2	\$15.38	\$248,040	
ВЗ	Fittings & Equipment						\$2,140,160
	B3.1 Fittings & Fixtures	1.00	9,396	m2	\$96.63	\$907,960	
	B3.3 Conveying Systems	1.00	9,396	m2	\$131.14	\$1,232,200	
C.	SERVICES						
C1	Mechanical						\$4,140,672
	C1.1 Plumbing & Drainage	1.00	9,396	m2	\$199.92	\$1,878,479	
	C1.2 Fire Protection	1.00	9,396		\$39.66	\$372,630	
	C1.3 Heating, Ventilation, Air Cond. C1.4 Controls	1.00 1.00	9,396		\$189.33	\$1,778,928	
	Electrical	1.00	9,396	1112	\$11.77	\$110,635	\$4,000,450
62				_			\$1,990,453
	C2.1 Service & Distribution C2.2 Lighting, Devices & Heating	1.00 1.00	9,396 9,396		\$56.55 \$54.81	\$531,321 \$514,986	
	C2.3 Systems & Ancillaries	1.00	9,396		\$100.48	\$944,145	
D.	SITE & ANCILLARY WORK						
	Site Work						\$83,116
1	D1.3 Electrical Site Services	1.00	9,396	m2	\$8.85	\$83,116	
7	GENERAL REQUIREMENTS	1.00	3,390		ψ0.00	ψου, 110	
	& ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$3,210,900
	Z1.1 General Requirements	1.00			\$218.27	\$2,050,900	
	Z1.2 Fees	1.00	9,396	m2	\$123.46	\$1,160,000	
Z2	Allowances						\$6,313,400
	Z2.1 Design Allowance	1.00	· ·	m2	\$516.48	\$4,852,800	
	Z2.2 Escalation Allowance Z2.3 Construction Allowance	1.00			Excluded	¢4 400 000	
	ZZ.3 CONSTRUCTION Allowance	1.00	9,396	m2	\$155.45	\$1,460,600	
1	Total				\$303	per sf	\$30,673,000

## CARBON COSTING STUDY - HIGH RISE MURB BASE BUILDING



CLASS D ESTIMATE (Rev.3) NOVEMBER 22, 2018

Gross Floor Area (m2) 9,396 Cost Per m2 3,192

						ost Per m2	3,192
					Location :	0	ttawa
				Elem	ental Cost		
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
		Natio	Quantity	OIIIL	Nate	Elellielli	Total
A.	SHELL						
A1.	Sub-Structure						\$2,211,189
	A1.1 Foundations	0.08	784	m2	\$2,635.17	\$2,065,977	
	A1.2 Basement Excavation	0.08	784	m2	\$185.22	\$145,212	
A2.	Structure						\$3,836,025
	A2.1 Lowest Floor Construction	0.08	784	m2	\$108.10	\$84,754	
	A2.2 Upper Floor Construction	0.92	8,613	m2	\$404.33		
	A2.3 Roof Construction	0.08	784	m2	\$342.83	\$268,779	
A3.	Exterior Enclosure						\$2,558,052
	A3.2 Walls Above Grade	0.38	3,547	m2	\$604.36	\$2,143,429	
	A3.3 Windows & Entrances	0.04	,	m2	\$703.48		
	A3.4 Roof Finish	0.08	784	m2	\$182.48	1	
	A3.5 Projections	1.00	9,396	m2	\$2.99	\$28,077	
В.	INTERIORS						
В1	Partitions & Doors						\$2,548,165
	B1.1 Partitions	1.21	11,361	m2	\$180.04	\$2,045,425	
	B1.2 Doors	0.15	,		\$365.08	\$502,740	
B2	Finishes		,-		, , , , , ,	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	\$1,329,944
		0.00	0.044	_	070.04	<b>A700 400</b>	
	B2.1 Floor Finishes B2.2 Ceiling Finishes	0.98 0.98	,		\$78.91 \$39.16	\$729,182 \$361,900	
	B2.3 Wall Finishes	1.72	16,129		\$14.81	\$238,863	
B2	Fittings & Equipment	2	10,120		<b>\$11.51</b>	<b>\$200,000</b>	\$2,097,357
53				_			
	B3.1 Fittings & Fixtures	1.00 1.00	,		\$94.70		
	B3.3 Conveying Systems	1.00	9,390	IIIZ	\$128.52	\$1,207,556	
1	SERVICES						
C1	Mechanical						\$4,004,030
	C1.1 Plumbing & Drainage	1.00	9,396	m2	\$193.33	\$1,816,489	
	C1.2 Fire Protection	1.00	,		\$38.35		
	C1.3 Heating, Ventilation, Air Cond.	1.00			\$183.08	\$1,720,224	
	C1.4 Controls	1.00	9,396	m2	\$11.39	\$106,984	
C2	Electrical						\$1,988,462
	C2.1 Service & Distribution	1.00	9,396	m2	\$56.49	\$530,790	
	C2.2 Lighting, Devices & Heating	1.00	9,396		\$54.75	\$514,471	
	C2.3 Systems & Ancillaries	1.00	9,396	m2	\$100.38	\$943,201	
D.	SITE & ANCILLARY WORK						
D1	Site Work						\$81,454
	D1.3 Electrical Site Services	1.00	9,396	m2	\$8.67	\$81,454	
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$3,146,682
	Z1.1 General Requirements	1.00	9,396	m2	\$213.91	\$2,009,882	
	Z1.2 Fees	1.00			\$120.99		
Z2	Allowances						\$6,187,132
	Z2.1 Design Allowance	1.00	9,396	m?	\$506.15	\$4,755,744	
	Z2.1 Design Allowance Z2.2 Escalation Allowance	1.00			\$506.15 Excluded		
	Z2.3 Construction Allowance	1.00	-		\$152.34		
	Tatal		<u> </u>	1			
	Total				\$297	per sf	\$29,988,000

#### **ELEMENTAL SUMMARY**

## CARBON COSTING STUDY - HIGH RISE MURB BASE BUILDING



CLASS D ESTIMATE (Rev.3) NOVEMBER 22, 2018

| Gross Floor Area (m2) | 9,396 |
| Cost Per m2 | 3,113 |
| Location : Montreal |
| Elemental Cost | Unit | Sub | Element

					Location :	Mo	ontreal	
Day	a mindia n			Elem	ental Cost Unit	Sub	Element	
	scription ment\Sub-Element	Ratio	Quantity	Unit	Rate	Element	Total	
A.	SHELL							
<b>A</b> 1.	Sub-Structure						\$2,207,781	
	A1.1 Foundations	0.08	784	m2	\$2,635.17	\$2,065,977		
	A1.2 Basement Excavation	0.08	784	m2	\$180.87	\$141,804		
<b>A2</b>	Structure						\$3,745,996	
	A2.1 Lowest Floor Construction	0.08	784	m2	\$105.57	\$82,764		
	A2.2 Upper Floor Construction A2.3 Roof Construction	0.92	8,613		\$394.84	\$3,400,761		
۸2	Exterior Enclosure	0.08	784	mz	\$334.78	\$262,471	£2.409.04£	
A3.		0.00	0.547	0	¢500.40	<b>#0.000.404</b>	\$2,498,016	
	A3.2 Walls Above Grade A3.3 Windows & Entrances	0.38 0.04	3,547 346		\$590.18 \$686.97	\$2,093,124 \$237,767		
	A3.4 Roof Finish	0.08	784		\$178.20	\$139,707		
	A3.5 Projections	1.00	9,396	m2	\$2.92	\$27,418		
В.	INTERIORS							
В1	Partitions & Doors						\$2,488,361	
	B1.1 Partitions	1.21	11,361		\$175.82	\$1,997,420		
	B1.2 Doors	0.15	1,377	m2	\$356.51	\$490,941		
B2	Finishes						\$1,400,288	
	B2.1 Floor Finishes	0.98	9,241		\$83.45	\$771,177		
	B2.2 Ceiling Finishes B2.3 Wall Finishes	0.98 1.72	9,241 16,129		\$41.51 \$15.22	\$383,552 \$245,560		
B3	Fittings & Equipment	1.72	10,129	1112	φ13.22	Ψ243,300	\$2,048,133	
53	B3.1 Fittings & Fixtures	1.00	9,396	m2	¢02.49	¢060 010	\$2,040,133	
	B3.3 Conveying Systems	1.00 1.00	9,396		\$92.48 \$125.50	\$868,918 \$1,179,215		
c.	SERVICES							
C1	Mechanical						\$3,838,403	
	C1.1 Plumbing & Drainage	1.00	9,396	m2	\$185.33	\$1,741,350	, , , , , , , ,	
	C1.2 Fire Protection	1.00	9,396		\$36.76	\$345,428		
	C1.3 Heating, Ventilation, Air Cond.	1.00	9,396		\$175.51	\$1,649,066		
	C1.4 Controls	1.00	9,396	m2	\$10.92	\$102,559		
C2	Electrical						\$1,831,216	
	C2.1 Service & Distribution C2.2 Lighting, Devices & Heating	1.00 1.00	9,396		\$52.02	\$488,816		
	C2.3 Systems & Ancillaries	1.00	9,396 9,396		\$50.42 \$92.45	\$473,787 \$868,614		
D.	SITE & ANCILLARY WORK		,			. ,		
D1	Site Work						\$79,542	
	D1.3 Electrical Site Services	1.00	9,396	m2	\$8.47	\$79,542	. ,	
z.	GENERAL REQUIREMENTS		.,			,.		
	& ALLOWANCES							
<b>Z</b> 1	General Requirements & Fees						\$3,072,831	
	Z1.1 General Requirements	1.00	9,396		\$208.89	\$1,962,711		
	Z1.2 Fees	1.00	9,396	m2	\$118.15	\$1,110,120		
Z2	Allowances						\$6,041,924	
	Z2.1 Design Allowance	1.00	9,396		\$494.27	\$4,644,130		
	Z2.2 Escalation Allowance Z2.3 Construction Allowance	1.00 1.00	9,396 9,396		Excluded \$148.76	\$1,397,794		
$\vdash$		1.00	5,590					
	Total				\$289	per sf	\$29,252,000	

### CARBON COSTING STUDY - HIGH RISE MURB BASE BUILDING



CLASS D ESTIMATE (Rev.3) NOVEMBER 22, 2018

Gross Floor Area (m2) 9,396 Cost Per m2 3,033

				Н	alifax		
_				Elem	ental Cost		
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
	SHELL						
A1.	Sub-Structure						\$2,034,509
	A1.1 Foundations	0.08	784	m2	\$2,418.51	\$1,896,112	
	A1.2 Basement Excavation	0.08		m2	\$176.53	\$138,396	
A2.	Structure						\$3,655,966
	A2.1 Lowest Floor Construction	0.08	784	m2	\$103.03	\$80,775	
	A2.2 Upper Floor Construction	0.92	8,613		\$385.35	\$3,319,029	
	A2.3 Roof Construction	0.08	784	m2	\$326.74	\$256,163	
A3.	Exterior Enclosure						\$2,437,980
	A3.2 Walls Above Grade	0.38	3,547		\$575.99	\$2,042,819	
	A3.3 Windows & Entrances A3.4 Roof Finish	0.04 0.08		m2 m2	\$670.46 \$173.91	\$232,052 \$136,349	
	A3.5 Projections	1.00	9,396		\$2.85	\$26,759	
В.	INTERIORS						
В1	Partitions & Doors						\$2,428,557
	B1.1 Partitions	1.21	11,361	m2	\$171.59	\$1,949,415	
	B1.2 Doors	0.15	1,377		\$347.94	\$479,142	
B2	Finishes						\$1,277,072
	B2.1 Floor Finishes	0.98	9,241	m2	\$75.10	\$694,059	
	B2.2 Ceiling Finishes	0.98	9,241	m2	\$37.70	\$348,367	
	B2.3 Wall Finishes	1.72	16,129	m2	\$14.55	\$234,646	
B3	Fittings & Equipment						\$1,998,909
	B3.1 Fittings & Fixtures	1.00	9,396		\$90.25	\$848,035	
	B3.3 Conveying Systems	1.00	9,396	m2	\$122.49	\$1,150,875	
	SERVICES						** *** ***
C1	Mechanical						\$3,842,544
	C1.1 Plumbing & Drainage C1.2 Fire Protection	1.00 1.00	9,396 9,396		\$185.53 \$36.80	\$1,743,229 \$345,801	
	C1.3 Heating, Ventilation, Air Cond.	1.00	9,396		\$30.80 \$175.70	\$1,650,845	
	C1.4 Controls	1.00	9,396		\$10.93	\$102,669	
C2	Electrical						\$1,853,111
	C2.1 Service & Distribution	1.00	9,396	m2	\$52.65	\$494,660	
	C2.2 Lighting, Devices & Heating	1.00	9,396		\$51.03	\$479,452	
	C2.3 Systems & Ancillaries	1.00	9,396	m2	\$93.55	\$878,999	
	SITE & ANCILLARY WORK						
1טן	Site Work					_	\$77,631
L	D1.3 Electrical Site Services	1.00	9,396	m2	\$8.26	\$77,631	
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$2,998,981
	Z1.1 General Requirements	1.00	9,396		\$203.87	\$1,915,541	
	Z1.2 Fees	1.00	9,396	m2	\$115.31	\$1,083,440	
22	Allowances						\$5,896,716
	Z2.1 Design Allowance Z2.2 Escalation Allowance	1.00	9,396		\$482.39	\$4,532,515	
	Z2.3 Construction Allowance	1.00 1.00	9,396 9,396		Excluded \$145.19	\$1,364,200	
	Total		<u> </u>	<u> </u>		per sf	\$28,502,000
	ı Otal				Ψ202	hei ai	Ψ <del>20,002,0</del> 00

#### **ELEMENTAL SUMMARY**

### CARBON COSTING STUDY - HIGH RISE MURB 100% CARBON REDUCTION

A.W. HOOKER ® QUANTITY SURVEYORS

CLASS D ESTIMATE (Rev.2) NOVEMBER 22, 2018

Gross Floor Area (m2)	9,396
Cost Per m2	3,353

					Location :	Van	couver
		Elemental Cost					
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit	Sub Element	Element Total
A.	SHELL						
A1.	. Sub-Structure						\$2,173,512
	A1.1 Foundations	0.08	784	m2	\$2,591.84	\$2,032,004	
	A1.2 Basement Excavation	0.08	_	m2	\$180.50	\$141,508	
A2.	. Structure						\$3,738,167
	A2.1 Lowest Floor Construction	0.08	784	m2	\$105.35	\$82,591	
	A2.2 Upper Floor Construction	0.92	8,613	m2	\$394.02	\$3,393,653	
	A2.3 Roof Construction	0.08	784	m2	\$334.08	\$261,922	
А3.	Exterior Enclosure						\$2,890,862
	A3.2 Walls Above Grade	0.38	3,547	m2	\$696.88	\$2,471,842	
ĺ	A3.3 Windows & Entrances	0.04		m2	\$685.53	\$237,270	
	A3.4 Roof Finish A3.5 Projections	0.08 1.00	784 9,396	m2	\$196.92 \$2.91	\$154,389 \$27,361	
L	INTERIORS	1.00	9,390	1112	φ2.51	φ21,301	
B1	Partitions & Doors						\$2,483,161
	B1.1 Partitions B1.2 Doors	1.21	11,361		\$175.45	\$1,993,246	
		0.15	1,377	m2	\$355.76	\$489,915	
B2	Finishes						\$1,413,952
	B2.1 Floor Finishes	0.98	9,241		\$88.99	\$822,334	
	B2.2 Ceiling Finishes B2.3 Wall Finishes	0.98 1.72	9,241 16,129		\$39.25 \$14.19	\$362,673 \$228,945	
B3	Fittings & Equipment	1.72	10,123	1112	ψ14.19	Ψ220,943	\$2,043,853
153		4.00	0.000	_	400.00	<b>#007.400</b>	\$2,043,653
	B3.1 Fittings & Fixtures B3.3 Conveying Systems	1.00 1.00	9,396 9,396		\$92.28 \$125.24	\$867,102 \$1,176,751	
٦	SERVICES	1.00	3,000	1112	ψ120.2 <del>+</del>	ψ1,170,701	
	Mechanical						¢4.044.005
٦.				_	****		\$4,844,395
	C1.1 Plumbing & Drainage C1.2 Fire Protection	1.00 1.00	9,396 9,396		\$219.27 \$36.21	\$2,060,289 \$340,211	
	C1.3 Heating, Ventilation, Air Cond.	1.00	9,396		\$231.92	\$2,179,153	
	C1.4 Controls	1.00	9,396		\$28.18	\$264,742	
C2	Electrical						\$1,971,984
	C2.1 Service & Distribution	1.00	9.396	m2	\$62.25	\$584,934	
	C2.2 Lighting, Devices & Heating	1.00	9,396	m2	\$57.19	\$537,320	
	C2.3 Systems & Ancillaries	1.00	9,396	m2	\$90.44	\$849,731	
D.	SITE & ANCILLARY WORK						
D1	Site Work						\$79,376
	D1.3 Electrical Site Services	1.00	9,396	m2	\$8.45	\$79,376	
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$3,325,788
	Z1.1 General Requirements	1.00	9,396	m2	\$226.10	\$2,124,398	
	Z1.2 Fees	1.00	9,396		\$127.86	\$1,201,390	
Z2	Allowances						\$6,539,458
	Z2.1 Design Allowance	1.00	9,396	m2	\$535.00	\$5,026,834	
	Z2.2 Escalation Allowance	1.00	9,396		Excluded	,	
	Z2.3 Construction Allowance	1.00	9,396	m2	\$160.99	\$1,512,625	
	Total				\$312	per sf	\$31,505,000
Ь						•	

### CARBON COSTING STUDY - HIGH RISE MURB 100% CARBON REDUCTION



CLASS D ESTIMATE (Rev.2) NOVEMBER 22, 2018

Gross Floor Area (m2) 9,396 Cost Per m2 3,533

					C	ost Per m2	3,533
					Location:	C	algary
				Elem	ental Cost		
	scription ement\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
	SHELL						
A1	. Sub-Structure						\$2,377,055
	A1.1 Foundations	0.08	784	m2	\$2,843.71	\$2,229,471	
	A1.2 Basement Excavation	0.08		m2	\$188.24	\$147,583	
A2	. Structure						\$3,898,654
	A2.1 Lowest Floor Construction	0.08	784	m2	\$109.87	\$86,137	
	A2.2 Upper Floor Construction	0.92	8,613		\$410.93		
	A2.3 Roof Construction	0.08	784	m2	\$348.43	\$273,167	
A3	. Exterior Enclosure						\$3,014,972
	A3.2 Walls Above Grade	0.38	3,547	m2	\$726.80	\$2,577,963	
	A3.3 Windows & Entrances	0.04		m2	\$714.96		
	A3.4 Roof Finish A3.5 Projections	0.08	784 9,396	m2	\$205.38		
L	•	1.00	9,390	IIIZ	\$3.04	\$28,535	
	INTERIORS						40
Bı	Partitions & Doors						\$2,589,767
	B1.1 Partitions B1.2 Doors	1.21 0.15	11,361		\$182.98	\$2,078,819	
	Priz Books	0.15	1,377	IIIZ	\$371.04	\$510,948	A4 470 505
							\$1,476,585
	B2.1 Floor Finishes B2.2 Ceiling Finishes	0.98 0.98	9,241 9,241		\$87.17 \$43.68	\$805,536 \$403,657	
	B2.3 Wall Finishes	1.72	16,129		\$43.06 \$16.58	\$267,391	
ВЗ	Fittings & Equipment	2	10,120		<b>\$10.00</b>	<b>\$201,001</b>	\$2,131,599
	B3.1 Fittings & Fixtures	1.00	9,396	m2	\$96.25	\$904,328	
	B3.3 Conveying Systems	1.00	9,396		\$130.62	\$1,227,271	
lc.	SERVICES		.,		,	, ,	
	Mechanical						\$5,178,674
	C1.1 Plumbing & Drainage	1.00	9,396	m2	\$234.40	\$2,202,456	\$0,110,014
	C1.2 Fire Protection	1.00	9,396		\$38.71	\$363,687	
	C1.3 Heating, Ventilation, Air Cond.	1.00	9,396	m2	\$247.93	\$2,329,522	
	C1.4 Controls	1.00	9,396	m2	\$30.12	\$283,010	
C2	! Electrical						\$2,158,227
	C2.1 Service & Distribution	1.00	9,396	m2	\$68.13	\$640,177	
	C2.2 Lighting, Devices & Heating	1.00	9,396		\$62.59	\$588,067	
	C2.3 Systems & Ancillaries	1.00	9,396	m2	\$98.98	\$929,983	
	SITE & ANCILLARY WORK						
D1	Site Work						\$82,784
	D1.3 Electrical Site Services	1.00	9,396	m2	\$8.81	\$82,784	
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$3,468,570
	Z1.1 General Requirements	1.00	9,396	m2	\$235.80	\$2,215,602	
	Z1.2 Fees	1.00	9,396	m2	\$133.35	\$1,252,968	
Z2	Allowances						\$6,820,210
	Z2.1 Design Allowance	1.00	9,396		\$557.97	\$5,242,645	
	Z2.2 Escalation Allowance Z2.3 Construction Allowance	1.00	9,396		Excluded \$167.90	¢1 577 564	
-		1.00	9,396	IIIZ	\$167.90	\$1,577,564	
	Total				\$328	per sf	\$33,197,000

#### **ELEMENTAL SUMMARY**

## CARBON COSTING STUDY - HIGH RISE MURB 100% CARBON REDUCTION

A.W. HOOKER ® QUANTITY SURVEYORS

CLASS D ESTIMATE (Rev.2) NOVEMBER 22, 2018

Gross Floor Area (m2)	9,396
Cost Per m2	3,540

					Location :	To	oronto
				Elem	ental Cost		Et
	cription nent\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
Α.	SHELL		-				
A1.	Sub-Structure						\$2,271,482
	A1.1 Foundations	0.08	784	m2	\$2,708.30	\$2,123,306	<del>+</del> -,-: .,
	A1.2 Basement Excavation	0.08		m2	\$189.00	\$148,176	
A2.	Structure						\$3,914,31
	A2.1 Lowest Floor Construction	0.08	784	m2	\$110.31	\$86,483	
	A2.2 Upper Floor Construction	0.92	8,613	m2	\$412.58	\$3,553,564	
	A2.3 Roof Construction	0.08	784	m2	\$349.83	\$274,264	
A3.	Exterior Enclosure						\$3,027,08
	A3.2 Walls Above Grade	0.38	3,547	m2	\$729.72	\$2,588,316	
	A3.3 Windows & Entrances	0.04		m2	\$717.84	\$248,450	
	A3.4 Roof Finish A3.5 Projections	0.08 1.00	784 9,396	m2 m2	\$206.20 \$3.05	\$161,664 \$28,650	
	INTERIORS	1.00	3,000	1112	ψ0.00	Ψ20,000	
	Partitions & Doors						\$2,600,16
ы	B1.1 Partitions	4.04	44.004	0	£400.70	¢0.007.400	
	B1.2 Doors	1.21 0.15	11,361 1,377		\$183.72 \$372.53	\$2,087,168 \$513,000	
B2	Finishes	0.10	1,017		\$672.00	φοτο,σσσ	\$1,398,23
	B2.1 Floor Finishes	0.98	9,241	m?	\$82.62	\$762 E40	Ψ1,330,23
	B2.2 Ceiling Finishes	0.98	9,241		\$62.62 \$41.84	\$763,542 \$386,645	
	B2.3 Wall Finishes	1.72	16,129		\$15.38	\$248,044	
ВЗ	Fittings & Equipment						\$2,140,16
	B3.1 Fittings & Fixtures	1.00	9,396	m2	\$96.63	\$907,960	
	B3.3 Conveying Systems	1.00	9,396		\$131.14	\$1,232,200	
C.	SERVICES						
C1	Mechanical						\$5,306,019
	C1.1 Plumbing & Drainage	1.00	9,396	m2	\$240.17	\$2,256,615	
	C1.2 Fire Protection	1.00	9,396	m2	\$39.66	\$372,630	
	C1.3 Heating, Ventilation, Air Cond.	1.00	9,396		\$254.02	\$2,386,805	
	C1.4 Controls	1.00	9,396	m2	\$30.86	\$289,969	
C2	Electrical						\$2,191,09
	C2.1 Service & Distribution	1.00	9,396		\$69.17	\$649,926	
	C2.2 Lighting, Devices & Heating C2.3 Systems & Ancillaries	1.00 1.00	9,396 9,396		\$63.54 \$100.48	\$597,022 \$944,145	
n	SITE & ANCILLARY WORK	1.00	9,090	1112	ψ100.40	ψ344,143	
	Site Work						\$83,11
וט	D1.3 Electrical Site Services	4.00	0.000	0	фо от	<b>COO 440</b>	
-		1.00	9,396	m2	\$8.85	\$83,116	
۷.	& ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$3,482,500
	Z1.1 General Requirements Z1.2 Fees	1.00 1.00	9,396 9,396		\$236.75 \$133.89	\$2,224,500 \$1,258,000	
Z2	Allowances						\$6,847,60
	Z2.1 Design Allowance	1.00	9,396	m2	\$560.21	\$5,263,700	
	Z2.2 Escalation Allowance	1.00	9,396		Excluded	, , , , , , , , , , , , , , , , , , ,	
	Z2.3 Construction Allowance	1.00	9,396		\$168.57	\$1,583,900	
	Total				\$329	per sf	\$33,262,000

### CARBON COSTING STUDY - HIGH RISE MURB 100% CARBON REDUCTION



CLASS D ESTIMATE (Rev.2) NOVEMBER 22, 2018

Gross Floor Area (m2) 9,396 Cost Per m2 3,460

					C	ost Per m2	3,460
					Location :	0	ttawa
				Elem	ental Cost		
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A.	SHELL						
Α1	. Sub-Structure						\$2,211,189
	A1.1 Foundations	0.08	701	m2	\$2,635.17	\$2,065,977	<del>+=,=::,:==</del>
	A1.2 Basement Excavation	0.08		m2	\$2,035.17 \$185.22	\$145,212	
1,2	. Structure	0.00	701		\$100.ZZ	Ψ110,212	\$3,836,025
		0.00	=0.4		4400.40	201751	\$3,030,023
	A2.1 Lowest Floor Construction A2.2 Upper Floor Construction	0.08 0.92	784 8,613	m2	\$108.10 \$404.33	\$84,754 \$3,482,493	
	A2.3 Roof Construction	0.92		m2	\$342.83	\$268,779	
٧3	. Exterior Enclosure	0.00	701		ψ0 12.00	Ψ200,110	\$2,966,539
		0.00	0.54		4715.40	** *** ***	\$2,500,555
	A3.2 Walls Above Grade A3.3 Windows & Entrances	0.38 0.04	3,547	m2 m2	\$715.13	\$2,536,550	
	A3.4 Roof Finish	0.04		m2	\$703.48 \$202.08	\$243,481 \$158,431	
	A3.5 Projections	1.00	9,396		\$2.99	\$28,077	
R	INTERIORS		.,		, , , ,	,.	
	Partitions & Doors						£2 E40 4CE
P							\$2,548,165
	B1.1 Partitions B1.2 Doors	1.21	11,361		\$180.04	\$2,045,425	
		0.15	1,377	m2	\$365.08	\$502,740	
B2	Finishes						\$1,329,948
	B2.1 Floor Finishes	0.98	9,241		\$78.91	\$729,182	
	B2.2 Ceiling Finishes	0.98	9,241		\$39.16	\$361,900	
	B2.3 Wall Finishes	1.72	16,129	m2	\$14.81	\$238,866	
ВЗ	Fittings & Equipment						\$2,097,357
	B3.1 Fittings & Fixtures	1.00	9,396	m2	\$94.70	\$889,801	
	B3.3 Conveying Systems	1.00	9,396	m2	\$128.52	\$1,207,556	
C.	SERVICES						
C1	Mechanical						\$5,130,920
	C1.1 Plumbing & Drainage	1.00	9,396	m2	\$232.24	\$2,182,147	
	C1.2 Fire Protection	1.00	9,396	m2	\$38.35	\$360,333	
	C1.3 Heating, Ventilation, Air Cond.	1.00	9,396		\$245.64	\$2,308,040	
	C1.4 Controls	1.00	9,396	m2	\$29.84	\$280,400	
C2	Electrical						\$2,188,902
	C2.1 Service & Distribution	1.00	9,396	m2	\$69.10	\$649,276	
	C2.2 Lighting, Devices & Heating	1.00	9,396	m2	\$63.48	\$596,425	
	C2.3 Systems & Ancillaries	1.00	9,396	m2	\$100.38	\$943,201	
D.	SITE & ANCILLARY WORK						
D1	Site Work						\$81,454
	D1.3 Electrical Site Services	1.00	9,396	m2	\$8.67	\$81,454	
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$3,412,850
	Z1.1 General Requirements	1.00	9,396	m2	\$232.01	\$2,180,010	, , ,
	Z1.2 Fees	1.00	9,396		\$131.21	\$1,232,840	
<b>Z</b> 2	Allowances				·		\$6,710,648
	Z2.1 Design Allowance	1.00	9,396	m?	\$549.00	\$5,158,426	÷ 5,1 15,8 10
	Z2.2 Escalation Allowance	1.00	9,396		Excluded	ψο, 100,420	
	Z2.3 Construction Allowance	1.00	9,396		\$165.20	\$1,552,222	
	Total		l	1	\$321	per sf	\$32,514,000
	:				<b>402</b> 1	r	,511,000

#### **ELEMENTAL SUMMARY**

## CARBON COSTING STUDY - HIGH RISE MURB 100% CARBON REDUCTION

A.W. HOOKER <sup>®</sup>
QUANTITY SURVEYORS

CLASS D ESTIMATE (Rev.2) NOVEMBER 22, 2018

Gross Floo		9,396	
С		3,372	
Location:	Mo	ontreal	
ntal Cost			

					Location :	Mo	ontreal
Doo	cription			Elem	ental Cost Unit	Sub	Element
	าent\Sub-Element	Ratio	Quantity	Unit	Rate	Element	Total
Α.	SHELL						
A1.	Sub-Structure						\$2,207,78
	A1.1 Foundations	0.08	784	m2	\$2,635.17	\$2,065,977	
	A1.2 Basement Excavation	0.08	784		\$180.87	\$141,804	
A2.	Structure						\$3,745,9
	A2.1 Lowest Floor Construction	0.08	784	m2	\$105.57	\$82,764	. , ,
	A2.2 Upper Floor Construction	0.92	8,613		\$394.84	\$3,400,761	
	A2.3 Roof Construction	0.08	784	m2	\$334.78	\$262,471	
A3.	Exterior Enclosure						\$2,896,9
	A3.2 Walls Above Grade	0.38	3,547	m2	\$698.34	\$2,477,019	
	A3.3 Windows & Entrances	0.04	346	m2	\$686.97	\$237,767	
	A3.4 Roof Finish	0.08	784		\$197.34	\$154,712	
	A3.5 Projections	1.00	9,396	m2	\$2.92	\$27,418	
	INTERIORS						
B1	Partitions & Doors						\$2,488,3
	B1.1 Partitions	1.21	11,361		\$175.82	\$1,997,420	
	B1.2 Doors	0.15	1,377	m2	\$356.51	\$490,941	
B2	Finishes						\$1,400,2
	B2.1 Floor Finishes	0.98	9,241		\$83.45	\$771,177	
	B2.2 Ceiling Finishes	0.98	9,241		\$41.51	\$383,552	
	B2.3 Wall Finishes	1.72	16,129	m2	\$15.22	\$245,564	
ВЗ	Fittings & Equipment						\$2,048,1
	B3.1 Fittings & Fixtures	1.00	9,396		\$92.48	\$868,918	
_	B3.3 Conveying Systems	1.00	9,396	m2	\$125.50	\$1,179,215	
	SERVICES						
C1	Mechanical						\$4,918,6
	C1.1 Plumbing & Drainage	1.00	9,396		\$222.64	\$2,091,882	
	C1.2 Fire Protection C1.3 Heating, Ventilation, Air Cond.	1.00	9,396		\$36.76	\$345,428	
	C1.4 Controls	1.00 1.00	9,396 9,396		\$235.48 \$28.61	\$2,212,568 \$268,801	
C2	Electrical		5,223		*====	<b>4</b> =22,22	\$2,015,8
-	C2.1 Service & Distribution	1.00	0.206	O	¢62.64	¢507.020	Ψ2,010,0
	C2.2 Lighting, Devices & Heating	1.00	9,396 9,396		\$63.64 \$58.46	\$597,932 \$549,260	
	C2.3 Systems & Ancillaries	1.00	9,396		\$92.45	\$868,614	
D.	SITE & ANCILLARY WORK						
D1	Site Work						\$79,5
	D1.3 Electrical Site Services	1.00	9,396	m2	\$8.47	\$79,542	
7	GENERAL REQUIREMENTS		0,000		ψο	Ų. 0,0 i.Z	
	& ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$3,332,7
	Z1.1 General Requirements	1.00	9,396	m2	\$226.57	\$2,128,847	, , , , ,
	Z1.2 Fees	1.00	9,396		\$128.13	\$1,203,906	
<b>Z</b> 2	Allowances						\$6,553,1
	Z2.1 Design Allowance	1.00	9,396	m2	\$536.12	\$5,037,361	,
	Z2.2 Escalation Allowance	1.00	9,396		Excluded	ψο,σοι,σοι	
	Z2.3 Construction Allowance	1.00	9,396		\$161.32	\$1,515,792	
	Total		I		¢242	per sf	\$31,687,00

#### **CARBON COSTING STUDY - HIGH RISE MURB 100% CARBON REDUCTION**



CLASS D ESTIMATE (Rev.2) NOVEMBER 22, 2018

Gross Floor Area (m2) 9,396 Cost Per m2

					C	ost Per m2	3,290
					Location:	Н	alifax
				Elem	ental Cost		
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A.	SHELL						
A1.	. Sub-Structure						\$2,034,509
	A1.1 Foundations	0.08	704	m2	\$2,418.51	\$1,896,112	<del>\$2,00.1,000</del>
	A1.2 Basement Excavation	0.08		m2	\$176.53	\$138,396	
۸2	. Structure	0.00	701		ψ170.00	ψ100,000	\$3,655,966
		0.00	=0.4		****	400 775	\$3,033,900
	A2.1 Lowest Floor Construction A2.2 Upper Floor Construction	0.08 0.92	784 8,613	m2	\$103.03 \$385.35	\$80,775 \$3,319,029	
	A2.3 Roof Construction	0.92		m2	\$326.74	\$256,163	
٧3	. Exterior Enclosure	0.00	701		ψ020.7 1	Ψ200,100	\$2,827,293
		0.00	0.545		4004.50	40.447.407	φ2,021,293
	A3.2 Walls Above Grade A3.3 Windows & Entrances	0.38 0.04	3,547	m2 m2	\$681.56	\$2,417,487	
	A3.4 Roof Finish	0.04		m2	\$670.46 \$192.59	\$232,052 \$150,994	
	A3.5 Projections	1.00	9,396		\$2.85	\$26,759	
R	INTERIORS		,,,,,,,		,	, ,, ,,	
	Partitions & Doors						£2.420.EE7
Р				_			\$2,428,557
	B1.1 Partitions B1.2 Doors	1.21	11,361		\$171.59	\$1,949,415	
		0.15	1,377	m2	\$347.94	\$479,142	
B2	Finishes						\$1,277,076
	B2.1 Floor Finishes	0.98	9,241		\$75.10	\$694,059	
	B2.2 Ceiling Finishes	0.98	9,241		\$37.70	\$348,367	
	B2.3 Wall Finishes	1.72	16,129	m2	\$14.55	\$234,650	
ВЗ	Fittings & Equipment						\$1,998,909
	B3.1 Fittings & Fixtures	1.00	9,396	m2	\$90.25	\$848,035	
	B3.3 Conveying Systems	1.00	9,396	m2	\$122.49	\$1,150,875	
C.	SERVICES						
C1	Mechanical						\$4,923,985
	C1.1 Plumbing & Drainage	1.00	9,396	m2	\$222.88	\$2,094,139	
	C1.2 Fire Protection	1.00	9,396	m2	\$36.80	\$345,801	
	C1.3 Heating, Ventilation, Air Cond.	1.00	9,396	m2	\$235.73	\$2,214,955	
	C1.4 Controls	1.00	9,396	m2	\$28.64	\$269,091	
C2	Electrical						\$2,039,908
	C2.1 Service & Distribution	1.00	9,396	m2	\$64.40	\$605,081	
	C2.2 Lighting, Devices & Heating	1.00	9,396	m2	\$59.16	\$555,828	
	C2.3 Systems & Ancillaries	1.00	9,396	m2	\$93.55	\$878,999	
D.	SITE & ANCILLARY WORK						
D1	Site Work						\$77,631
	D1.3 Electrical Site Services	1.00	9,396	m2	\$8.26	\$77,631	
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$3,252,655
	Z1.1 General Requirements	1.00	9,396	m2	\$221.12	\$2,077,683	+ 5,2 52,300
	Z1.2 Fees	1.00	9,396		\$221.12 \$125.05	\$2,077,003	
Z2	Allowances		.,				\$6,395,658
	Z2.1 Design Allowance	1.00	9,396	m?	\$523.23	\$4,916,296	<del>+3,555,556</del>
	Z2.2 Escalation Allowance	1.00	9,396		\$523.23 Excluded	φ4,510,∠90	
	Z2.3 Construction Allowance	1.00	9,396		\$157.45	\$1,479,363	
	Total		1	1	¢30e	per sf	\$30,912,000
L	Total				<b> 9306</b>	hei ai	<del>430,3</del> 12,000

#### **ELEMENTAL SUMMARY**

#### **CARBON COSTING STUDY - HIGH RISE OFFICE BASE BUILDING**

W. HOOKER ®

CLASS D ESTIMATE (Rev.4)

NOVEMBER 22, 2018 49,896 Gross Floor Area (m2) Cost Per m2 2,396 Vancouver Location: **Elemental Cost** Sub Unit Element A. SHELL A1. Sub-Structure \$3,550,094 A1.1 Foundations 3,577 m2 \$798.72 \$2,857,019 A1.2 Basement Excavation 0.07 3,577 m2 \$193.76 \$693,075 A2. Structure \$27,575,122 A2.1 Lowest Floor Construction 3,577 m2 \$89.66 \$320,721 0.07 A2.2 Upper Floor Construction 0.93 46,319 m2 \$561.39 \$26,002,878 A2.3 Roof Construction 0.07 3,563 m2 \$351.26 \$1,251,523 A3. Exterior Enclosure \$9,877,384 A3.2 Walls Above Grade 11.590 m2 0.23 \$790.24 \$9.158.870 A3.3 Windows & Entrances 0.00 18 m2 \$3,087.83 \$55,581 A3.4 Roof Finish 0.07 3,563 m2 \$171.57 \$611,315 A3.5 Projections 1.00 49,896 m2 \$1.03 \$51,618 B. INTERIORS **B1 Partitions & Doors** \$638,704 **B1.1 Partitions** \$382.00 \$267,400 0.01 700 m2 B1.2 Doors 0.01 337 m2 \$1,101.79 \$371,304 **B2** Finishes \$6,345,970 **B2.1 Floor Finishes** 0.95 47,401 m2 \$59.72 \$2,830,804 B2.2 Ceiling Finishes 0.95 47,401 m2 \$49.67 \$2,354,577 B2.3 Wall Finishes 1.80 89,813 m2 \$12.92 \$1,160,589 **B3 Fittings & Equipment** \$2,431,972 B3.1 Fittings & Fixtures 1.00 49,896 m2 \$21.95 \$1,094,972 **B3.3 Conveying Systems** 1.00 49,896 m2 \$26.80 \$1,337,000 C. SERVICES C1 Mechanical \$22,385,481 C1.1 Plumbing & Drainage 49,896 m2 \$57.34 \$2,861,259 1.00 C1.2 Fire Protection 1.00 49,896 m2 \$29.06 \$1,450,010 C1.3 Heating, Ventilation, Air Cond. 1.00 49,896 m2 \$324.86 \$16,209,248 C1.4 Controls 1.00 \$37.38 \$1,864,963 49,896 m2 C2 Electrical \$12,787,143 C2.1 Service & Distribution 49,896 m2 \$3,198,807 1.00 \$64.11 C2.2 Lighting, Devices & Heating 1.00 49,896 m2 \$101.03 \$5,040,766 C2.3 Systems & Ancillaries 1.00 49,896 m2 \$91.14 \$4,547,570 D. SITE & ANCILLARY WORK D1 Site Work \$351,257 D1.3 Electrical Site Services 49,896 m2 \$351,257 1.00 \$7.04 Z. GENERAL REQUIREMENTS & ALLOWANCES Z1 General Requirements & Fees \$8,663,474 Z1.1 General Requirements 1 00 49,896 m2 \$117.49 \$5,862,459 Z1.2 Fees 1.00 49,896 m2 \$56.14 \$2,801,015 Z2 Allowances \$24,924,163 Z2.1 Design Allowance 49,896 m2 \$383.95 \$19,157,587 1.00 Z2.2 Escalation Allowance 49,896 m2 1.00 Excluded Z2.3 Construction Allowance 1.00 49,896 m2 \$115.57 \$5,766,577 Total \$223 per sf \$119,531,000

A.W. HOOKER ASSOCIATES LTD. PROJECT NO:116065 PAGE C1 PAGE C1 A.W. HOOKER ASSOCIATES LTD. PROJECT NO:116065

#### **CARBON COSTING STUDY - HIGH RISE** OFFICE BASE BUILDING



CLASS D ESTIMATE (Rev.4) NOVEMBER 22, 2018

Gross Floor Area (m2) 49,896 Cost Per m2 2,529

			G	algary			
				Elem	ental Cost		
	scription ement\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
	SHELL		- Cauring				
A1	. Sub-Structure						\$3,857,491
	A1.1 Foundations	0.07	3,577	m2	\$876.34	\$3,134,661	
	A1.2 Basement Excavation	0.07	3,577	m2	\$202.08	\$722,830	
A2	. Structure						\$28,758,976
	A2.1 Lowest Floor Construction	0.07	3,577		\$93.51	\$334,490	
	A2.2 Upper Floor Construction A2.3 Roof Construction	0.93 0.07	46,319 3,563		\$585.49 \$366.34		
Δ3	. Exterior Enclosure	0.07	3,303	1112	φ300.34	\$1,305,253	\$10,301,439
	A3.2 Walls Above Grade	0.23	11,590	m2	¢924.47	\$9,552,078	
	A3.3 Windows & Entrances	0.23	-	m2	\$824.17 \$3,220.40	\$9,552,076 \$57,967	
	A3.4 Roof Finish	0.07	3,563		\$178.94	\$637,560	
	A3.5 Projections	1.00	49,896	m2	\$1.08	\$53,834	
В.	INTERIORS						
В1	Partitions & Doors						\$666,125
	B1.1 Partitions	0.01		m2	\$398.40	\$278,880	
	B1.2 Doors	0.01	337	m2	\$1,149.09	\$387,245	
B2	Finishes						\$6,749,126
	B2.1 Floor Finishes B2.2 Ceiling Finishes	0.95 0.95	47,401 47,401		\$58.50 \$55.29	\$2,772,979	
	B2.3 Wall Finishes	1.80	47,401 89,813		\$35.29 \$15.09	\$2,620,659 \$1,355,488	
ВЗ	Fittings & Equipment					, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	\$2,536,382
	B3.1 Fittings & Fixtures	1.00	49,896	m2	\$22.89	\$1,141,982	
	B3.3 Conveying Systems	1.00	49,896		\$27.95	\$1,394,400	
C.	SERVICES						
C1	Mechanical						\$23,930,153
	C1.1 Plumbing & Drainage	1.00	49,896	m2	\$61.30	\$3,058,696	
	C1.2 Fire Protection	1.00	49,896		\$31.07	\$1,550,066	
	C1.3 Heating, Ventilation, Air Cond. C1.4 Controls	1.00 1.00	49,896 49,896		\$347.28 \$39.96	\$17,327,740 \$1,993,652	
C2	Electrical		,		******	* 1,111,111	\$13,994,818
	C2.1 Service & Distribution	1.00	49,896	m2	\$70.16	\$3,500,917	
	C2.2 Lighting, Devices & Heating	1.00	49,896		\$110.57	\$5,516,839	
	C2.3 Systems & Ancillaries	1.00	49,896	m2	\$99.75	\$4,977,062	
	SITE & ANCILLARY WORK						
D1	Site Work						\$366,337
	D1.3 Electrical Site Services	1.00	49,896	m2	\$7.34	\$366,337	
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$9,035,413
	Z1.1 General Requirements Z1.2 Fees	1.00	-		\$122.54	\$6,114,145	
72	Allowances	1.00	49,896	1112	\$58.55	\$2,921,268	
	Z2.1 Design Allowance	1.00	49,896	m?	¢400.42	\$19,980,059	\$25,994,206
	Z2.1 Design Allowance Z2.2 Escalation Allowance	1.00 1.00			\$400.43 Excluded	φ 19,960,059	
	Z2.3 Construction Allowance	1.00	49,896		\$120.53	\$6,014,147	
	Total			•	\$235	per sf	\$126,190,000
					•	-	

#### **ELEMENTAL SUMMARY**

#### **CARBON COSTING STUDY - HIGH RISE** OFFICE BASE BUILDING



	ASS D ESTIMATE (Rev.4)						
NC	OVEMBER 22, 2018				Gross Floo	r Area (m2) ost Per m2	49,896 2,541
					Location :		pronto
				Elem	ental Cost		
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
	SHELL						
A1	. Sub-Structure						\$3,711,124
	A1.1 Foundations	0.07	3,577	m2	\$834.61	\$2,985,391	+-,
	A1.2 Basement Excavation	0.07	3,577		\$202.89	\$725,733	
<b>A2</b>	Structure						\$28,874,474
ì	A2.1 Lowest Floor Construction	0.07	3,577	m2	\$93.89	\$335,834	
	A2.2 Upper Floor Construction	0.93	46,319	m2	\$587.84	\$27,228,145	
	A2.3 Roof Construction	0.07	3,563	m2	\$367.81	\$1,310,495	
А3	Exterior Enclosure						\$10,342,810
	A3.2 Walls Above Grade	0.23	11,590		\$827.48		
	A3.3 Windows & Entrances A3.4 Roof Finish	0.00		m2	\$3,233.33		
	A3.5 Projections	0.07 1.00	3,563 49,896		\$179.66 \$1.08	\$640,120 \$54,050	
В.	INTERIORS		,		*****	***,****	
	Partitions & Doors						\$668,800
	B1.1 Partitions	0.01	700	m2	\$400.00	\$280,000	\$000,000
	B1.2 Doors	0.01	337		\$1,153.71	\$388,800	
B2	Finishes						\$6,396,036
	B2.1 Floor Finishes	0.95	47,401	m2	\$55.45	\$2,628,416	
	B2.2 Ceiling Finishes	0.95	47,401		\$52.96		
	B2.3 Wall Finishes	1.80	89,813	m2	\$14.00	\$1,257,410	
В3	Fittings & Equipment						\$2,546,568
	B3.1 Fittings & Fixtures	1.00	49,896	m2	\$22.98	\$1,146,568	
	B3.3 Conveying Systems	1.00	49,896	m2	\$28.06	\$1,400,000	
C.	SERVICES						
C1	Mechanical						\$24,518,600
	C1.1 Plumbing & Drainage	1.00	49,896		\$62.81		
	C1.2 Fire Protection C1.3 Heating, Ventilation, Air Cond.	1.00 1.00	49,896		\$31.83 \$355.82	, , , -	
	C1.4 Controls	1.00	49,896 49,896		\$40.94	\$2,042,676	
C2	Electrical		-,		, , ,	, ,,, ,,,	\$14,207,937
	C2.1 Service & Distribution	1.00	49,896	m2	\$71.23	\$3,554,230	
	C2.2 Lighting, Devices & Heating	1.00	49,896		\$112.25		
	C2.3 Systems & Ancillaries	1.00	49,896	m2	\$101.27	\$5,052,855	
D.	SITE & ANCILLARY WORK						
D1	Site Work						\$367,809
	D1.3 Electrical Site Services	1.00	49,896	m2	\$7.37	\$367,809	
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$9,071,700
	Z1.1 General Requirements Z1.2 Fees	1.00 1.00	49,896 49,896		\$123.03 \$58.78	\$6,138,700 \$2,933,000	
<b>7</b> 2	Allowances	1.00	70,000	1114	φυυ./ο	Ψ2,300,000	
		4.00	40.000	mo	¢402.04	#20 0e0 200	\$26,098,600
	Z2.1 Design Allowance Z2.2 Escalation Allowance	1.00 1.00	49,896 49,896		\$402.04 Excluded	\$20,060,300	
	Z2.3 Construction Allowance	1.00	49,896		\$121.02	\$6,038,300	
	Total				\$236	per sf	\$126,804,000

#### **CARBON COSTING STUDY - HIGH RISE** OFFICE BASE BUILDING



CLASS D ESTIMATE (Rev.4) NOVEMBER 22, 2018

49,896 Gross Floor Area (m2) Cost Per m2 2,485

			0	ttawa			
				Elem	ental Cost		
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
	SHELL	rtatio	quantity	Onic	rtato	Liomont	rotar
	Sub-Structure						\$3,616,004
	A1.1 Foundations	0.07	3,577	m2	\$812.07	\$2,904,785	
	A1.2 Basement Excavation	0.07	3,577		\$198.83	\$711,218	
A2.	Structure						\$28,296,984
	A2.1 Lowest Floor Construction	0.07	3,577	m2	\$92.01	\$329,117	
	A2.2 Upper Floor Construction A2.3 Roof Construction	0.93	46,319		\$576.08	\$26,683,582	
١,,	Exterior Enclosure	0.07	3,563	m2	\$360.45	\$1,284,285	040 405 054
AJ.			44 500		****	** ***	\$10,135,954
	A3.2 Walls Above Grade A3.3 Windows & Entrances	0.23 0.00	11,590 18	m2 m2	\$810.93 \$3,168.67	\$9,398,631 \$57,036	
	A3.4 Roof Finish	0.07	3,563		\$176.06	\$627,318	
	A3.5 Projections	1.00	49,896	m2	\$1.06	\$52,969	
В.	INTERIORS						
В1	Partitions & Doors						\$655,424
	B1.1 Partitions	0.01		m2	\$392.00	\$274,400	
	B1.2 Doors	0.01	337	m2	\$1,130.64	\$381,024	
B2	Finishes						\$6,070,580
	B2.1 Floor Finishes	0.95	47,401		\$52.96	\$2,510,137	
	B2.2 Ceiling Finishes B2.3 Wall Finishes	0.95 1.80	47,401 89,813		\$49.57 \$13.48	\$2,349,557 \$1,210,886	
B3	Fittings & Equipment	1.00	09,013	1112	ψ10. <del>4</del> 0	ψ1,210,000	\$2,495,637
ľ	B3.1 Fittings & Fixtures	1.00	49,896	m2	\$22.52	\$1,123,637	ΨΣ,433,037
	B3.3 Conveying Systems	1.00	49,896		\$22.52 \$27.50	\$1,372,000	
c.	SERVICES						
C1	Mechanical						\$23,709,486
	C1.1 Plumbing & Drainage	1.00	49,896	m2	\$60.74	\$3,030,491	
	C1.2 Fire Protection	1.00	49,896		\$30.78	\$1,535,772	
	C1.3 Heating, Ventilation, Air Cond.	1.00	49,896		\$344.07	\$17,167,955	
	C1.4 Controls	1.00	49,896	m2	\$39.59	\$1,975,268	******
U2	Electrical					40	\$14,193,729
	C2.1 Service & Distribution C2.2 Lighting, Devices & Heating	1.00 1.00	49,896 49,896		\$71.16 \$112.14	\$3,550,676 \$5,595,251	
	C2.3 Systems & Ancillaries	1.00	49,896		\$112.14		
D.	SITE & ANCILLARY WORK						
	Site Work						\$360,452
	D1.3 Electrical Site Services	1.00	49,896	m2	\$7.22	\$360,452	
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$8,890,266
	Z1.1 General Requirements	1.00	49,896	m2	\$120.57	\$6,015,926	
	Z1.2 Fees	1.00	49,896	m2	\$57.61	\$2,874,340	
Z2	Allowances						\$25,576,628
	Z2.1 Design Allowance	1.00	-		\$394.00	\$19,659,094	
	Z2.2 Escalation Allowance Z2.3 Construction Allowance	1.00 1.00	49,896 49,896		Excluded \$118.60	\$5,917,534	
-		1.00	49,090	1112			
	Total				\$231	per sf	\$124,001,000

#### **ELEMENTAL SUMMARY**

#### **CARBON COSTING STUDY - HIGH RISE OFFICE BASE BUILDING**

W. HOOKER ®

CLASS D ESTIMATE (Rev.4) NOVEMBER 22, 2018 49,896 Gross Floor Area (m2) Cost Per m2 2,413 Montreal Location: **Elemental Cost** Sub Unit Element A. SHELL A1. Sub-Structure \$3,599,312 A1.1 Foundations 3,577 m2 \$812.07 \$2,904,785 A1.2 Basement Excavation 0.07 3,577 m2 \$194.16 \$694,526 A2. Structure \$27,632,871 A2.1 Lowest Floor Construction 3,577 m2 \$89.85 \$321,393 0.07 A2.2 Upper Floor Construction 0.93 46,319 m2 \$562.56 \$26,057,335 A2.3 Roof Construction 0.07 3,563 m2 \$351.99 \$1,254,144 A3. Exterior Enclosure \$9,898,069 A3.2 Walls Above Grade 11.590 m2 0.23 \$791.89 \$9,178,051 A3.3 Windows & Entrances 0.00 18 m2 \$3,094.30 \$55,697 A3.4 Roof Finish 0.07 3,563 m2 \$171.93 \$612,595 A3.5 Projections 1.00 49,896 m2 \$1.04 \$51,726 B. INTERIORS **B1 Partitions & Doors** \$640,042 **B1.1 Partitions** \$382.80 \$267,960 0.01 700 m2 B1.2 Doors 0.01 337 m2 \$1,104.10 \$372,082 **B2** Finishes \$6,389,664 **B2.1 Floor Finishes** 0.95 47,401 m2 \$56.01 \$2,654,700 B2.2 Ceiling Finishes 0.95 47,401 m2 \$52.53 \$2,490,128 B2.3 Wall Finishes 1.80 89,813 m2 \$13.86 \$1,244,836 **B3 Fittings & Equipment** \$2,437,066 B3.1 Fittings & Fixtures 1.00 49,896 m2 \$21.99 \$1,097,266 **B3.3 Conveying Systems** 1.00 49,896 m2 \$26.85 \$1,339,800 C. SERVICES C1 Mechanical \$22,728,742 C1.1 Plumbing & Drainage 49,896 m2 \$58.22 \$2,905,134 1.00 C1.2 Fire Protection 1.00 49,896 m2 \$29.51 \$1,472,245 \$329.84 \$16,457,802 C1.3 Heating, Ventilation, Air Cond. 1.00 49,896 m2 C1.4 Controls 1.00 \$37.95 \$1,893,561 49,896 m2 C2 Electrical \$13,071,302 C2.1 Service & Distribution 49,896 m2 \$3,269,892 1.00 \$65.53 C2.2 Lighting, Devices & Heating 1.00 49,896 m2 \$103.27 \$5,152,783 C2.3 Systems & Ancillaries 1.00 49,896 m2 \$93.17 \$4,648,627 D. SITE & ANCILLARY WORK D1 Site Work \$351,993 D1.3 Electrical Site Services 49,896 m2 \$351,993 1.00 \$7.05 Z. GENERAL REQUIREMENTS & ALLOWANCES Z1 General Requirements & Fees \$8,681,617 \$5.874.736 Z1.1 General Requirements 1 00 49,896 m2 \$117.74 Z1.2 Fees 1.00 49,896 m2 \$56.25 \$2,806,881 Z2 Allowances \$24,976,360

49,896 m2

49,896 m2

49,896 m2

1.00

1.00

1.00

\$384.75 \$19,197,707

\$224 per sf

\$5,778,653

\$120,407,000

Excluded

\$115.81

PAGE C1 A.W. HOOKER ASSOCIATES LTD. PROJECT NO:116065 PAGE C1 A.W. HOOKER ASSOCIATES LTD. PROJECT NO:116065

Z2.1 Design Allowance

Total

Z2.2 Escalation Allowance

Z2.3 Construction Allowance

### CARBON COSTING STUDY - HIGH RISE OFFICE BASE BUILDING



CLASS D ESTIMATE (Rev.4) NOVEMBER 22, 2018

Gross Floor Area (m2) 49,896 Cost Per m2 2,365

						ost Per m2	2,365
					Location:	Н	lalifax
			Elemental Cost				
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A.	SHELL						
A1	Sub-Structure						\$3,343,789
	A1.1 Foundations	0.07	3,577	m2	\$745.30	\$2,665,954	
	A1.2 Basement Excavation	0.07	3,577		\$189.50	\$677,835	
A2	Structure						\$26,968,758
	A2.1 Lowest Floor Construction	0.07	3,577	m2	\$87.69	\$313,668	
	A2.2 Upper Floor Construction	0.93	46,319	m2	\$549.04	\$25,431,087	
	A2.3 Roof Construction	0.07	3,563	m2	\$343.53	\$1,224,002	
А3	Exterior Enclosure						\$9,660,185
	A3.2 Walls Above Grade	0.23	11,590	m2	\$772.86	\$8,957,471	
	A3.3 Windows & Entrances	0.00	18	m2	\$3,019.93	\$54,359	
	A3.4 Roof Finish	0.07	· ·		\$167.80	\$597,872	
	A3.5 Projections	1.00	49,896	m2	\$1.01	\$50,483	
B.	INTERIORS						
В1	Partitions & Doors						\$624,659
	B1.1 Partitions	0.01	700	m2	\$373.60	\$261,520	
	B1.2 Doors	0.01	337	m2	\$1,077.56	\$363,139	
B2	Finishes						\$5,840,439
	B2.1 Floor Finishes	0.95	47,401	m2	\$50.40	\$2,389,230	
	B2.2 Ceiling Finishes	0.95	47,401	m2	\$47.71	\$2,261,699	
	B2.3 Wall Finishes	1.80	89,813	m2	\$13.24	\$1,189,510	
ВЗ	Fittings & Equipment						\$2,378,495
	B3.1 Fittings & Fixtures	1.00	49,896	m2	\$21.46	\$1,070,895	
	B3.3 Conveying Systems	1.00	49,896	m2	\$26.21	\$1,307,600	
C.	SERVICES						
C1	Mechanical						\$22,753,260
	C1.1 Plumbing & Drainage	1.00	49,896	m2	\$58.29	\$2,908,268	
	C1.2 Fire Protection	1.00	· ·		\$29.54		
	C1.3 Heating, Ventilation, Air Cond.	1.00	49,896	m2	\$330.20	\$16,475,556	
	C1.4 Controls	1.00	49,896	m2	\$37.99	\$1,895,604	
C2	Electrical						\$13,227,589
	C2.1 Service & Distribution	1.00	49,896	m2	\$66.32	\$3,308,988	
	C2.2 Lighting, Devices & Heating	1.00	49,896	m2	\$104.51	\$5,214,393	
	C2.3 Systems & Ancillaries	1.00	49,896	m2	\$94.28	\$4,704,208	
D.	SITE & ANCILLARY WORK						
D1	Site Work						\$343,533
	D1.3 Electrical Site Services	1.00	49,896	m2	\$6.88	\$343,533	
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$8,472,968
	Z1.1 General Requirements	1.00	49,896	m2	\$114.91	\$5,733,546	
	Z1.2 Fees	1.00			\$54.90	1	
Z2	Allowances						\$24,376,092
	Z2.1 Design Allowance	1.00	,		\$375.51	\$18,736,320	
	Z2.2 Escalation Allowance	1.00			Excluded		
	Z2.3 Construction Allowance	1.00	49,896	m2	\$113.03	\$5,639,772	
	Total			_	\$220	per sf	\$117,990,000

#### **ELEMENTAL SUMMARY**

Z1 General Requirements & Fees

Z1.1 General Requirements

Z2.3 Construction Allowance

Z2.1 Design Allowance

Z1.2 Fees

Z2 Allowances

Total

### CARBON COSTING STUDY - HIGH RISE OFFICE 100% CARBON REDUCTION



\$8,882,455

\$25,553,031

\$122,753,000

CLASS D ESTIMATE (Rev.4) DECEMBER 06, 2018 Gross Floor Area (m2) 49.896 Cost Per m2 2,460 Location: Vancouver **Elemental Cost** Sub Unit Element Element\Sub-Element A. SHELL A1. Sub-Structure \$3,550,094 A1.1 Foundations 3,577 m2 \$798.72 \$2,857,019 A1.2 Basement Excavation 0.07 3,577 m2 \$193.76 \$693,075 A2. Structure \$27,575,122 A2.1 Lowest Floor Construction 0.07 3,577 m2 \$89.66 \$320,721 A2.2 Upper Floor Construction 0.93 46,319 m2 \$561.39 \$26,002,878 A2.3 Roof Construction 0.07 3,563 m2 \$351.26 \$1,251,523 A3. Exterior Enclosure \$11,337,848 A3.2 Walls Above Grade 11,590 m2 \$910.38 \$10,551,281 0.23 A3.3 Windows & Entrances 0.00 18 m2 \$3,087.83 \$55,581 A3.4 Roof Finish 0.07 3,563 m2 \$190.67 \$679,368 A3.5 Projections 1.00 49,896 m2 \$1.03 \$51,618 B. INTERIORS **B1 Partitions & Doors** \$638,704 **B1.1 Partitions** 0.01 700 m2 \$382.00 \$267,400 B1.2 Doors 0.01 337 m2 \$1,101.79 \$371,304 **B2** Finishes \$5,374,746 **B2.1 Floor Finishes** 0.95 47,401 m2 \$59.72 \$2,830,804 B2.2 Ceiling Finishes 0.95 47,401 m2 \$29.18 \$1,383,353 B2.3 Wall Finishes 89,813 m2 \$12.92 \$1,160,589 1.80 B3 Fittings & Equipment \$8,170,953 B3.1 Fittings & Fixtures 1.00 49,896 m2 \$21.95 \$1,094,972 \$5,738,981 B3.2 Equipment 1.00 49,896 m2 \$115.02 B3.3 Conveying Systems 1.00 49,896 m2 \$26.80 \$1,337,000 . SERVICES C1 Mechanical \$17,179,540 C1.1 Plumbing & Drainage 49,896 m2 \$55.39 \$2,763,720 C1.2 Fire Protection 1.00 49,896 m2 \$29.06 \$1,450,010 C1.3 Heating, Ventilation, Air Cond. 49,896 m2 \$221.40 \$11,046,928 1.00 C1.4 Controls 1.00 49,896 m2 \$38.46 \$1,918,881 C2 Electrical \$14,138,805 C2.1 Service & Distribution 49,896 m2 \$74.10 \$3,697,322 C2.2 Lighting, Devices & Heating 1.00 49,896 m2 \$118.12 \$5,893,913 C2.3 Systems & Ancillaries 1.00 49,896 m2 \$91.14 \$4,547,570 D. SITE & ANCILLARY WORK D1 Site Work \$351,257 D1.3 Electrical Site Services 49,896 m2 \$7.04 \$351,257 GENERAL REQUIREMENTS & ALLOWANCES

49,896 m2

49,896 m2

49,896 m2

49,896 m2

1.00

1.00

\$120.47

\$57.55

\$118.48

\$6,010,770

\$2,871,685

\$5,911,737

\$393.64 \$19,641,294

\$229 per sf

### CARBON COSTING STUDY - HIGH RISE OFFICE 100% CARBON REDUCTION



CLASS D ESTIMATE (Rev.4) DECEMBER 06, 2018

Gross Floor Area (m2) 49,896 Cost Per m2 2,594

						ost Per m2	2,594
		Location : C				algary	
		Elemental Cost					
Des	scription				Unit	Sub	Element
Ele	ment\Sub-Element	Ratio	Quantity	Unit	Rate	Element	Total
A.	SHELL						
Δ1.	Sub-Structure						\$3,857,491
	A1.1 Foundations	0.07	0.577		0070.04	<b>*** ***</b>	\$0,001,401
	A1.2 Basement Excavation	0.07 0.07	3,577 3,577		\$876.34 \$202.08		
		0.07	3,377	1112	\$202.00	\$122,030	***
A2.	Structure						\$28,758,976
	A2.1 Lowest Floor Construction	0.07	3,577		\$93.51		
	A2.2 Upper Floor Construction A2.3 Roof Construction	0.93	46,319		\$585.49	. , ,	
		0.07	3,563	m2	\$366.34	\$1,305,253	
A3.	Exterior Enclosure						\$11,824,604
	A3.2 Walls Above Grade	0.23	11,590	m2	\$949.46	\$11,004,268	
	A3.3 Windows & Entrances	0.00		m2	\$3,220.40	\$57,967	
	A3.4 Roof Finish	0.07	3,563		\$198.86		
	A3.5 Projections	1.00	49,896	m2	\$1.08	\$53,834	
В.	INTERIORS						
В1	Partitions & Doors						\$666,125
	B1.1 Partitions	0.01	700	m2	\$398.40	\$278,880	
	B1.2 Doors	0.01	337	m2	\$1,149.09	\$387,245	
B2	Finishes						\$5,668,148
	B2.1 Floor Finishes	0.95	47,401	m2	\$58.50	\$2,772,979	
	B2.2 Ceiling Finishes	0.95	47,401		\$32.48	. , ,	
	B2.3 Wall Finishes	1.80	89,813		\$15.09	\$1,355,488	
В3	Fittings & Equipment						\$8,521,748
-		4.00	40.000	_	<b>***</b>	04 444 000	ψ0,021,740
	B3.1 Fittings & Fixtures B3.2 Equipment	1.00 1.00	,		\$22.89		
	B3.3 Conveying Systems	1.00	49,896 49,896		\$119.96 \$27.95		
		1.00	40,000	1112	Ψ27.33	ψ1,004,400	
	SERVICES						
C1	Mechanical						\$18,364,984
	C1.1 Plumbing & Drainage	1.00	49,896	m2	\$59.21	\$2,954,426	
	C1.2 Fire Protection	1.00	,		\$31.07	. ,,	
	C1.3 Heating, Ventilation, Air Cond.	1.00	49,896		\$236.68		
	C1.4 Controls	1.00	49,896	m2	\$41.11	\$2,051,290	
C2	Electrical						\$15,474,136
	C2.1 Service & Distribution	1.00	49,896	m2	\$81.10		
1	C2.2 Lighting, Devices & Heating	1.00			\$129.28		
	C2.3 Systems & Ancillaries	1.00	49,896	m2	\$99.75	\$4,977,062	
D.	SITE & ANCILLARY WORK						
D1	Site Work						\$366,337
	D1.3 Electrical Site Services	1.00	49,896	m2	\$7.34	\$366,337	
Z.	GENERAL REQUIREMENTS						
	& ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$9,263,796
	Z1.1 General Requirements	1.00	49,896	m2	\$125.64	\$6,268,824	
	Z1.2 Fees	1.00			\$60.02		
72	Allowances	1.00	.0,000		\$30.02	\$2,00 i,012	¢26 650 072
1							\$26,650,072
Ī	Z2.1 Design Allowance	1.00	,		\$410.54		
<u></u>	Z2.3 Construction Allowance	1.00	49,896	m2	\$123.57	\$6,165,539	
1	Total				\$241	per sf	\$129,416,000

#### **ELEMENTAL SUMMARY**

### CARBON COSTING STUDY - HIGH RISE OFFICE 100% CARBON REDUCTION



CLASS D ESTIMATE (Rev.4) DECEMBER 06, 2018

2018				49,896		
	ost Per m2	2,605				
		Location:	To	oronto		
			Elem	ental Cost		
				Unit	Sub	Element
ent	Ratio	Quantity	Unit	Rate	Element	Total

		Location: T			To	oronto	
		Elemental Cost					
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A.	SHELL						
A1.	Sub-Structure						\$3,711,124
	A1.1 Foundations	0.07	3,577	m2	\$834.61	\$2,985,391	
	A1.2 Basement Excavation	0.07	3,577		\$202.89	\$725,733	
A2.	Structure						\$28,874,474
	A2.1 Lowest Floor Construction	0.07	3,577	m2	\$93.89	\$335,834	
	A2.2 Upper Floor Construction	0.93	46,319	m2	\$587.84	\$27,228,145	
	A2.3 Roof Construction	0.07	3,563	m2	\$367.81	\$1,310,495	
А3.	Exterior Enclosure						\$11,872,092
	A3.2 Walls Above Grade	0.23	11,590	m2	\$953.28	\$11,048,462	
	A3.3 Windows & Entrances	0.00		m2	\$3,233.33		
	A3.4 Roof Finish	0.07	3,563		\$199.66		
L	A3.5 Projections	1.00	49,896	m2	\$1.08	\$54,050	
	INTERIORS						
B1	Partitions & Doors						\$668,800
	B1.1 Partitions	0.01	700		\$400.00	\$280,000	
	B1.2 Doors	0.01	337	m2	\$1,153.71	\$388,800	*
B2	Finishes						\$5,360,616
	B2.1 Floor Finishes	0.95	47,401		\$55.45		
	B2.2 Ceiling Finishes B2.3 Wall Finishes	0.95 1.80	47,401 89,813		\$31.11 \$14.00	\$1,474,790 \$1,257,410	
B3	Fittings & Equipment	1.00	09,013	1112	\$14.00	\$1,237,410	\$8,555,972
53		4.00	40.000	0	<b>#00.00</b>	£4.440.500	\$0,555,972
	B3.1 Fittings & Fixtures B3.2 Equipment	1.00 1.00	49,896 49,896		\$22.98 \$120.44		
	B3.3 Conveying Systems	1.00	49,896		\$28.06	\$1,400,000	
C.	SERVICES						
C1	Mechanical						\$18,816,582
	C1.1 Plumbing & Drainage	1.00	49,896	m2	\$60.67	\$3,027,076	, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
	C1.2 Fire Protection	1.00	49,896		\$31.83		
	C1.3 Heating, Ventilation, Air Cond.	1.00	49,896	m2	\$242.50	\$12,099,592	
	C1.4 Controls	1.00	49,896	m2	\$42.12	\$2,101,732	
C2	Electrical						\$15,709,783
1	C2.1 Service & Distribution	1.00	49,896	m2	\$82.33	\$4,108,136	
	C2.2 Lighting, Devices & Heating	1.00	49,896		\$131.25		
L	C2.3 Systems & Ancillaries	1.00	49,896	m2	\$101.27	\$5,052,855	
	SITE & ANCILLARY WORK						
D1	Site Work						\$367,809
1	D1.3 Electrical Site Services	1.00	49,896	m2	\$7.37	\$367,809	
Z.	GENERAL REQUIREMENTS & ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$9,301,000
	Z1.1 General Requirements Z1.2 Fees	1.00 1.00	49,896 49,896		\$126.14 \$60.27	\$6,294,000 \$3,007,000	
Z2	Allowances						\$26,757,100
1	Z2.1 Design Allowance	1.00	49,896	m2	\$412.19	\$20,566,800	
	Z2.3 Construction Allowance	1.00	49,896		\$124.06		
	Total				\$242	per sf	\$129,995,000
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#### **CARBON COSTING STUDY - HIGH RISE OFFICE 100% CARBON REDUCTION**



CLASS D ESTIMATE (Rev.4) DECEMBER 06, 2018

Gross Floor Area (m2) 49,896 Cost Per m2 2,551

					Location :	ost Per m2	2,551
			ttawa				
				Elem	ental Cost		
	scription				Unit	Sub	Element
Ele	ment\Sub-Element	Ratio	Quantity	Unit	Rate	Element	Total
A.	SHELL						
A1	. Sub-Structure						\$3,616,004
	A4.4 Foundations	0.07	0.577		#040.0 <del>7</del>	<b>***</b> *** <b>*** ** ** ** * * </b>	40,010,001
	A1.1 Foundations A1.2 Basement Excavation	0.07	3,577		\$812.07	\$2,904,785	
		0.07	3,577	m2	\$198.83	\$711,218	
A2	. Structure						\$28,296,984
	A2.1 Lowest Floor Construction	0.07	3,577	m2	\$92.01	\$329,117	
	A2.2 Upper Floor Construction	0.93	46,319	m2	\$576.08	\$26,683,582	
	A2.3 Roof Construction	0.07	3,563	m2	\$360.45	\$1,284,285	
А3	. Exterior Enclosure						\$11,634,650
	A3.2 Walls Above Grade	0.23	11,590	m2	\$934.21	\$10,827,493	
	A3.3 Windows & Entrances	0.23	-	m2	\$3,168.67	\$57,036	
	A3.4 Roof Finish	0.07	3,563		\$195.66	\$697,152	
	A3.5 Projections	1.00	49,896		\$1.06	\$52,969	
L	INTERIORS		2,230	-	, ,,,,,	,- 30	
1							
IB1	Partitions & Doors						\$655,424
	B1.1 Partitions	0.01	700	m2	\$392.00	\$274,400	
	B1.2 Doors	0.01	337	m2	\$1,130.64	\$381,024	
B2	Finishes						\$5,101,427
	B2.1 Floor Finishes	0.95	47,401	m2	\$52.96	\$2,510,137	
	B2.2 Ceiling Finishes	0.95	47,401 47,401		\$32.90 \$29.12	\$1,380,403	
	B2.3 Wall Finishes	1.80	89,813		\$13.48	\$1,210,886	
D2		1.00	00,010		ψ10.10	ψ1,210,000	
В	Fittings & Equipment						\$8,384,853
	B3.1 Fittings & Fixtures	1.00	49,896	m2	\$22.52	\$1,123,637	
	B3.2 Equipment	1.00	49,896		\$118.03		
	B3.3 Conveying Systems	1.00	49,896	m2	\$27.50	\$1,372,000	
C.	SERVICES						
C1	Mechanical						\$18,195,635
	C1.1 Plumbing & Drainage	1.00	49,896	O	<b>\$50.67</b>	¢0.007.400	
	C1.2 Fire Protection	1.00	49,896		\$58.67 \$30.78	\$2,927,182 \$1,535,772	
	C1.3 Heating, Ventilation, Air Cond.	1.00	49,896		\$234.49		
	C1.4 Controls	1.00	49,896		\$40.73	\$2,032,375	
دع	Electrical		.5,550	_	\$ .5.70	,=,: <b>32</b> ,570	\$4F CO4 C70
ľ							\$15,694,073
	C2.1 Service & Distribution	1.00	49,896		\$82.25	\$4,104,028	
	C2.2 Lighting, Devices & Heating	1.00	49,896		\$131.12		
L	C2.3 Systems & Ancillaries	1.00	49,896	m2	\$101.17	\$5,047,802	
D.	SITE & ANCILLARY WORK						
D1	Site Work						\$360,452
	D1.3 Electrical Site Services	1.00	49,896	m2	\$7.22	\$360,452	
_	GENERAL REQUIREMENTS		2,230	-	, <u></u>		
<u>اک</u>	& ALLOWANCES						
ļ,,							<b>AC 1115</b>
21	General Requirements & Fees						\$9,114,980
	Z1.1 General Requirements	1.00			\$123.62	\$6,168,120	
	Z1.2 Fees	1.00	49,896	m2	\$59.06	\$2,946,860	
Z2	Allowances						\$26,221,958
	Z2.1 Design Allowance	1.00	49,896	m2	\$403.95	\$20,155,464	
	Z2.3 Construction Allowance	1.00			\$121.58	\$6,066,494	
$\vdash$			-,	<u> </u>			
	Total				\$237	per sf	\$127,276,000

#### **ELEMENTAL SUMMARY**

#### **CARBON COSTING STUDY - HIGH RISE OFFICE 100% CARBON REDUCTION**



CLASS D ESTIMATE (Rev.4)

DECEMBER 06, 2018 Gross Floor Area (m2) 49,896 Cost Per m2 2,476 Location: Montreal **Elemental Cost** 

				Elem	ental Cost		
Description Element\S	on Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A. SHE							
A1. Sub-	Structure						\$3,599,31
A1.1 I	Foundations	0.07	3,577	m2	\$812.07	\$2,904,785	
A1.2 I	Basement Excavation	0.07	3,577		\$194.16	\$694,526	
A2. Struc	cture						\$27,632,87
A2.1 I	_owest Floor Construction	0.07	3,577	m2	\$89.85	\$321,393	
	Upper Floor Construction	0.93	46,319		\$562.56	\$26,057,335	
	Roof Construction	0.07	3,563	m2	\$351.99	\$1,254,144	
	rior Enclosure						\$11,361,59
	Walls Above Grade Windows & Entrances	0.23 0.00	11,590	m2 m2	\$912.28 \$3,094.30	\$10,573,378 \$55,697	
	Roof Finish	0.07	3,563		\$191.07	\$680,791	
A3.5 I	Projections	1.00	49,896	m2	\$1.04	\$51,726	
B. INTE	RIORS						
B1 Parti	tions & Doors						\$640,04
B1.1 I	Partitions	0.01	700	m2	\$382.80	\$267,960	
B1.2 I	Doors	0.01	337	m2	\$1,104.10	\$372,082	
B2 Finis	hes						\$5,362,52
	Floor Finishes	0.95	47,401	m2	\$56.01	\$2,654,700	
	Ceiling Finishes Wall Finishes	0.95	47,401		\$30.86 \$13.86	\$1,462,992	
	ıgs & Equipment	1.80	89,813	m∠	\$13.86	\$1,244,836	<b>#0.400.00</b>
	•			_			\$8,188,06
	Fittings & Fixtures Equipment	1.00 1.00	49,896 49,896		\$21.99 \$115.26	\$1,097,266 \$5,751,000	
	Conveying Systems	1.00	49,896		\$26.85	\$1,339,800	
C. SER	VICES						
C1 Mech	nanical						\$17,442,97
C1.1	Plumbing & Drainage	1.00	49,896	m2	\$56.24	\$2,806,099	. , ,
C1.2	Fire Protection	1.00	49,896		\$29.51	\$1,472,245	
	Heating, Ventilation, Air Cond.	1.00	49,896		\$224.79		
	Controls	1.00	49,896	m2	\$39.05	\$1,948,305	
C2 Elect							\$14,453,00
	Service & Distribution	1.00	49,896		\$75.75	\$3,779,485	
	Lighting, Devices & Heating Systems & Ancillaries	1.00 1.00	49,896 49,896		\$120.75 \$93.17	\$6,024,888 \$4,648,627	
D. SITE	& ANCILLARY WORK		,		*****	¥ 1,0 10,0=1	
D1 Site \							\$351,99
D1.3	Electrical Site Services	1.00	49,896	m2	\$7.05	\$351,993	7
	ERAL REQUIREMENTS LOWANCES		,		*****	<b>,</b>	
	eral Requirements & Fees						\$8,901,05
	General Requirements	1.00	49,896	m2	\$120.72	\$6,023,358	ψυ,συ 1,00
Z1.1 C	·	1.00	49,896		\$57.67	\$2,877,699	
Z2 Allov	vances						\$25,606,54
Z2.1 [	Design Allowance	1.00	49,896	m2	\$394.47	\$19,682,428	
	Construction Allowance	1.00	49,896		\$118.73	\$5,924,117	
Total			·		\$230		\$123,540,00

A.W. HOOKER ASSOCIATES LTD. PROJECT NO:116065 PAGE C1 A.W. HOOKER ASSOCIATES LTD. PAGE C1 PROJECT NO:116065

## CARBON COSTING STUDY - HIGH RISE OFFICE 100% CARBON REDUCTION



CLASS D ESTIMATE (Rev.4) DECEMBER 06, 2018

Gross Floor Area (m2) 49,896 Cost Per m2 2,426

					C	ost Per m2	2,426
			alifax				
	scription ment\Sub-Element	Ratio	Quantity	Unit	Unit Rate	Sub Element	Element Total
A.	SHELL						
A1.	Sub-Structure						\$3,343,789
	A1.1 Foundations	0.07	3,577	m2	\$745.30	\$2,665,954	
	A1.2 Basement Excavation	0.07	3,577		\$189.50	\$677,835	
A2.	Structure						\$26,968,758
	A2.1 Lowest Floor Construction	0.07	3,577	m2	\$87.69	\$313,668	<del>+</del> ,,-
	A2.2 Upper Floor Construction	0.07	46,319		\$549.04	-	
	A2.3 Roof Construction	0.07	3,563		\$343.53	\$1,224,002	
А3.	Exterior Enclosure						\$11,088,534
	A3.2 Walls Above Grade	0.23	11,590	m2	\$890.36	\$10,319,264	<b>4</b> 1 1,0 0 0,0 0 1
	A3.3 Windows & Entrances	0.00	-	m2	\$3,019.93	\$54,359	
	A3.4 Roof Finish	0.07	3,563		\$186.48	\$664,429	
	A3.5 Projections	1.00	49,896	m2	\$1.01	\$50,483	
В.	INTERIORS						
В1	Partitions & Doors						\$624,659
	B1.1 Partitions	0.01	700	m2	\$373.60	\$261,520	, , , , , , , , , , , , , , , , , , , ,
	B1.2 Doors	0.01		m2	\$1,077.56	\$363,139	
B2	Finishes				, ,,,	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	\$4,907,526
	B2.1 Floor Finishes	0.95	47,401	m2	\$50.40	\$2,389,230	<b>\$1,001,020</b>
	B2.2 Ceiling Finishes	0.95	47,401 47,401		\$30.40 \$28.03		
	B2.3 Wall Finishes	1.80	89,813		\$13.24	, ,,	
ВЗ	Fittings & Equipment						\$7,991,278
	B3.1 Fittings & Fixtures	1.00	49,896	m2	\$21.46	\$1,070,895	41,001,210
	B3.2 Equipment	1.00	49,896		\$21.40 \$112.49		
	B3.3 Conveying Systems	1.00	49,896		\$26.21	\$1,307,600	
c.	SERVICES						
C1	Mechanical						\$17,461,788
	C1.1 Plumbing & Drainage	1.00	49,896	m2	¢56.20	¢2 900 127	<b>\$11,401,100</b>
	C1.2 Fire Protection	1.00	49,896		\$56.30 \$29.54	\$2,809,127 \$1,473,833	
	C1.3 Heating, Ventilation, Air Cond.	1.00	49,896		\$225.04		
	C1.4 Controls	1.00	49,896		\$39.09	\$1,950,407	
C2	Electrical						\$14,625,808
	C2.1 Service & Distribution	1.00	49,896	m2	\$76.65	\$3,824,675	
	C2.2 Lighting, Devices & Heating	1.00	49,896		\$122.19	\$6,096,925	
1	C2.3 Systems & Ancillaries	1.00	49,896		\$94.28	\$4,704,208	
D.	SITE & ANCILLARY WORK						
D1	Site Work						\$343,533
	D1.3 Electrical Site Services	1.00	49,896	m2	\$6.88	\$343,533	
Z.	GENERAL REQUIREMENTS						
	& ALLOWANCES						
<b>Z</b> 1	General Requirements & Fees						\$8,687,134
1	Z1.1 General Requirements	1.00	49,896	m2	\$117.82	\$5,878,596	
	Z1.2 Fees	1.00	49,896		\$56.29	\$2,808,538	
Z2	Allowances						\$24,991,131
1	Z2.1 Design Allowance	1.00	49,896	m2	\$384.99	\$19,209,391	
	Z2.3 Construction Allowance	1.00	49,896		\$115.88	\$5,781,740	
	Total				\$225	per sf	\$121,034,000
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A.W. HOOKER ASSOCIATES LTD. PROJECT NO:116065 PAGE C1





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