Vancouver Special 2.0

Third Quadrant Design
University of British Columbia

Vancouver Special 2.0

Third Quadrant Design
University of British Columbia

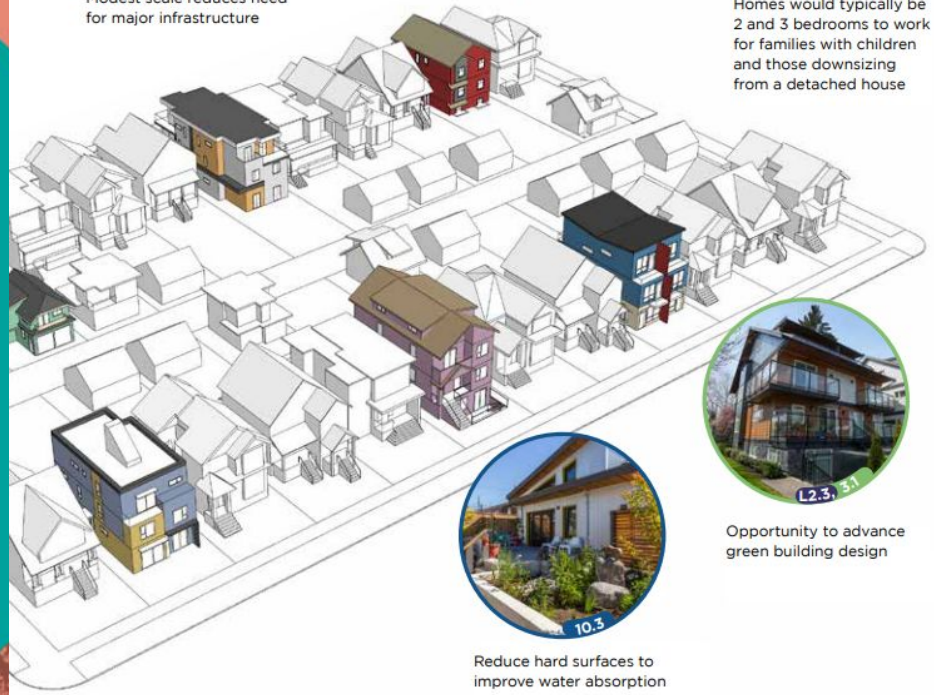

million new homes

Source: The Vancouver Plan

Modest scale reduces need for major infrastructure

Can fit on a single lot

Homes would typically be 2 and 3 bedrooms to work for families with children and those downsizing from a detached house



Opportunity to advance green building design

Reduce hard surfaces to improve water absorption

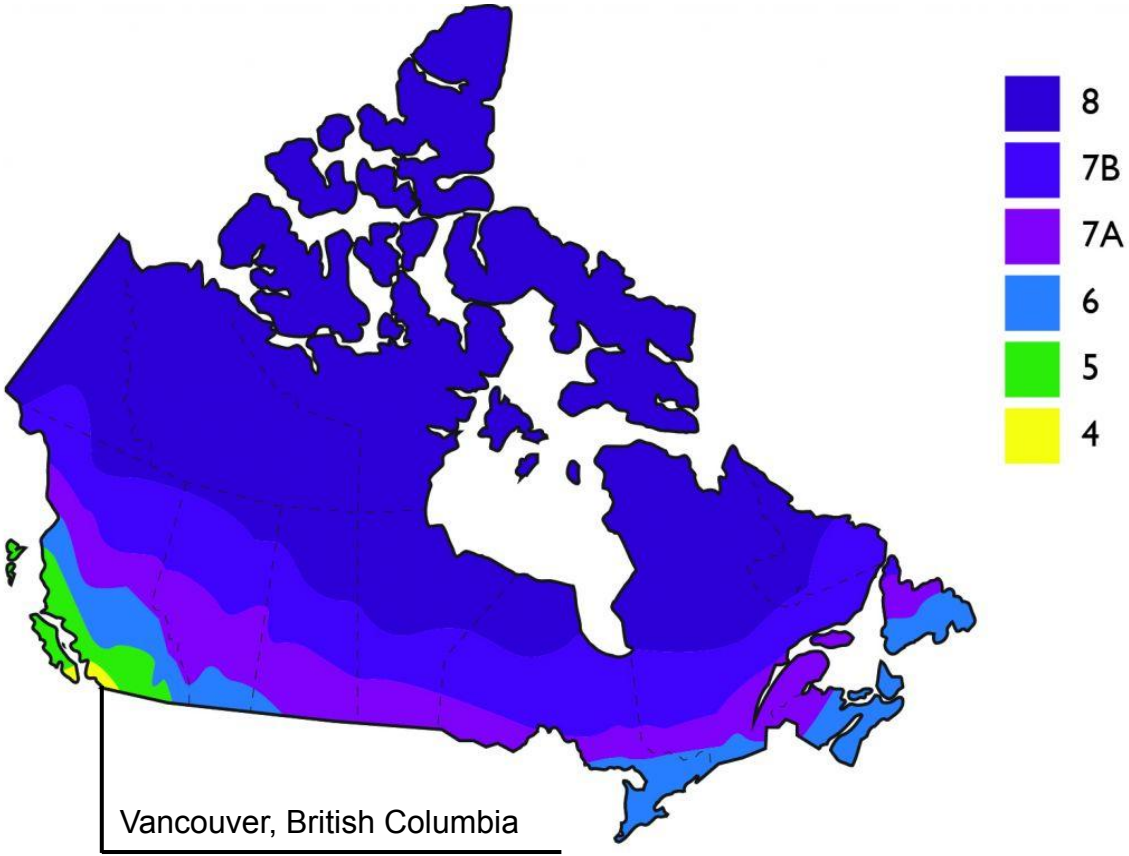
50

Source: The Vancouver Plan

CLIMATE

Warm, Dry Summers
Wildfire Smoke Risk

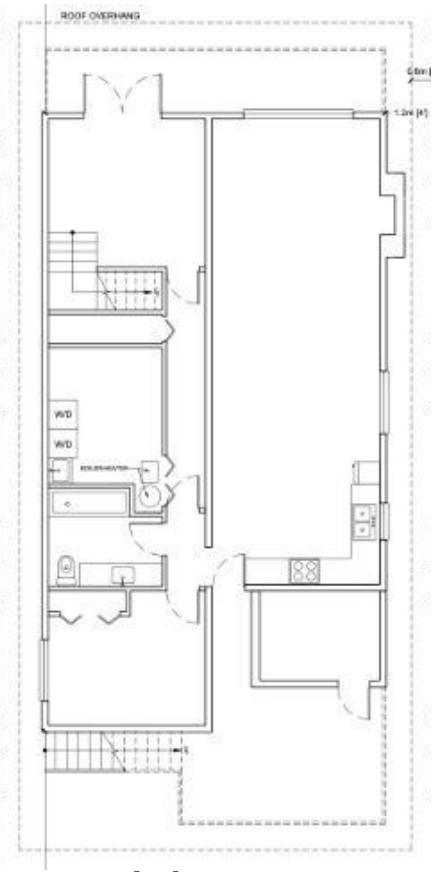
Moderate, Rainy Winters



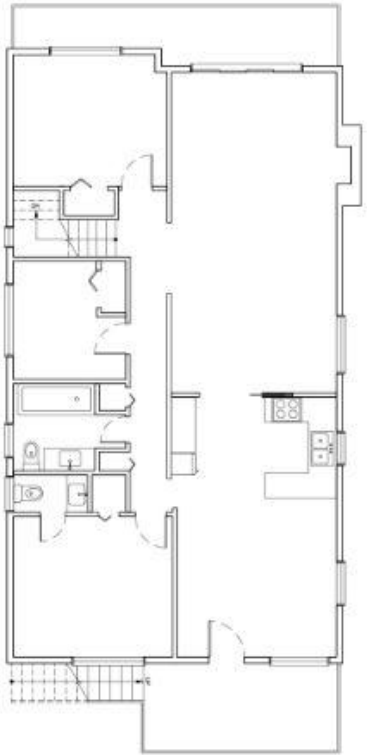
Source: Vancouver is Awesome

Source: Construction Canada

VANCOUVER SPECIAL

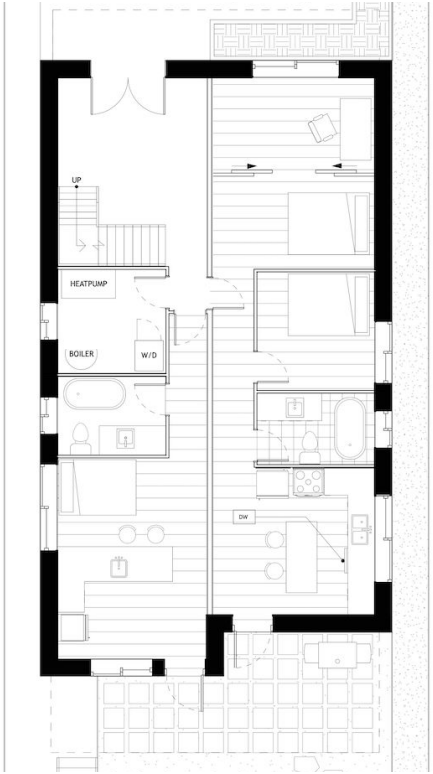


Ground Floor

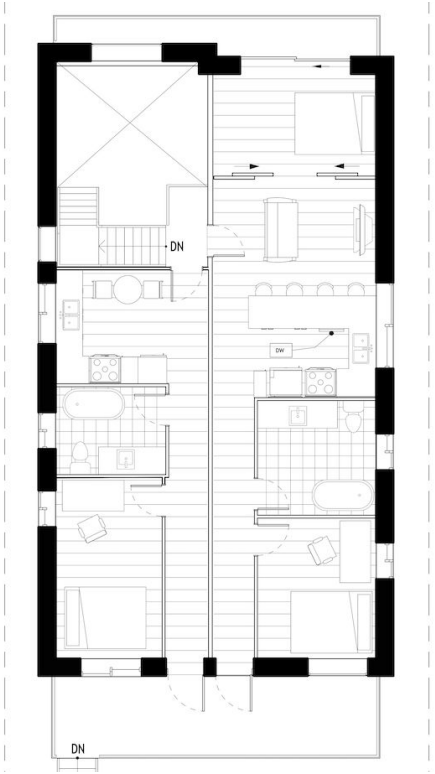


Second Floor

VANCOUVER SPECIAL 2.0

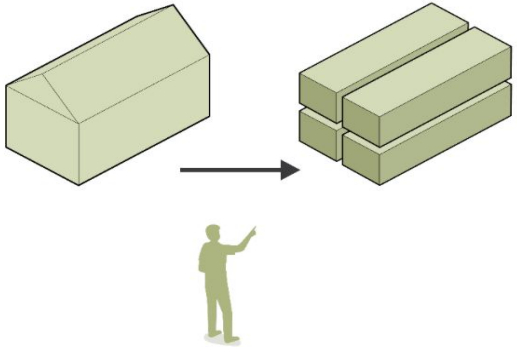


Ground Floor

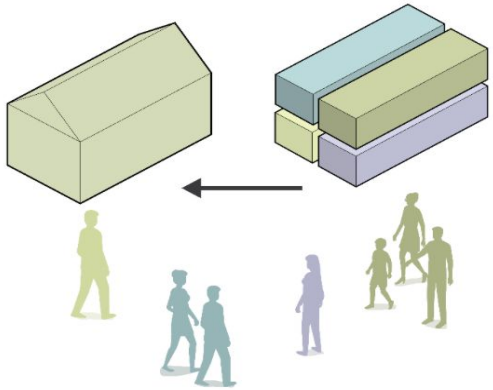


Second Floor

OUR VISION



Citizen Developer



Stratified Housing

$183/s.f.

Retrofit Cost

$400,000

Increase in Homeowner Equity since 2018

DESIGN GOALS

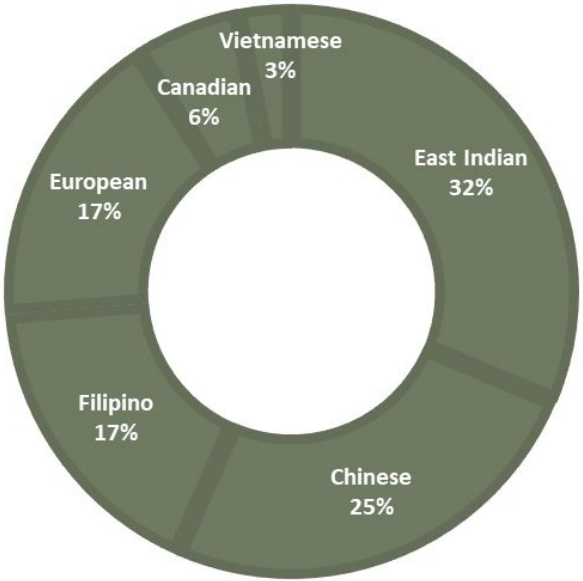
Affordability
& Availability

Replicability

Resilience

Net-Zero

THE SUNSET NEIGHBOURHOOD



Design Strategies

TARGET OCCUPANTS

Students/
Young Professionals

20-30 years old

age group represents the largest proportion of population in Sunset

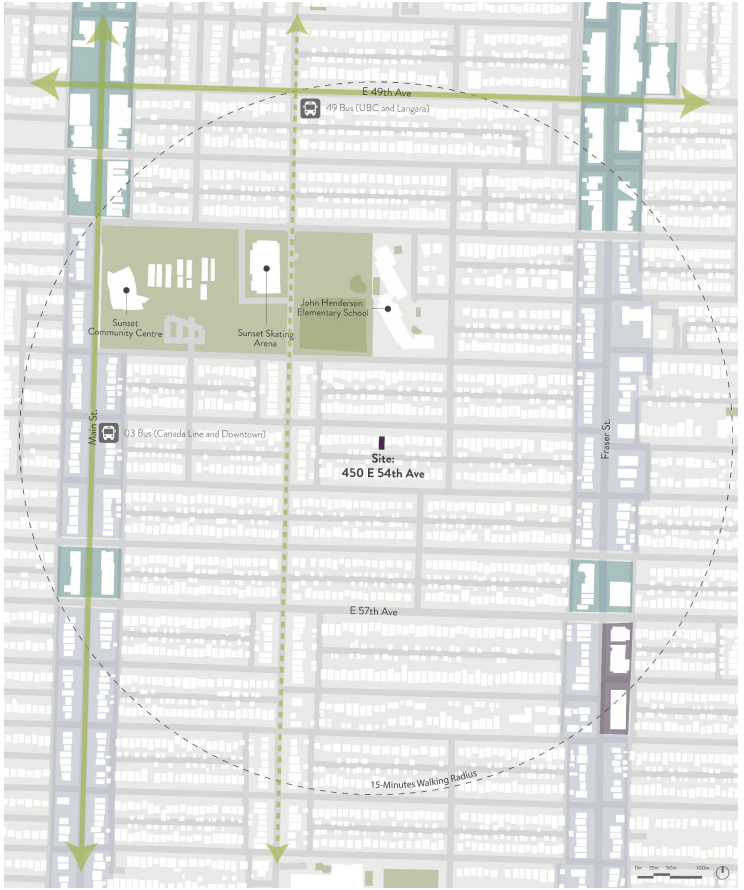
49 Bus to UBC and Langara

Families

3.1 Average Household Size

Neighbourhood with the *largest* household size (Vancouver's average of 2.1)

John Henderson Elementary School & Sunset Community Centre



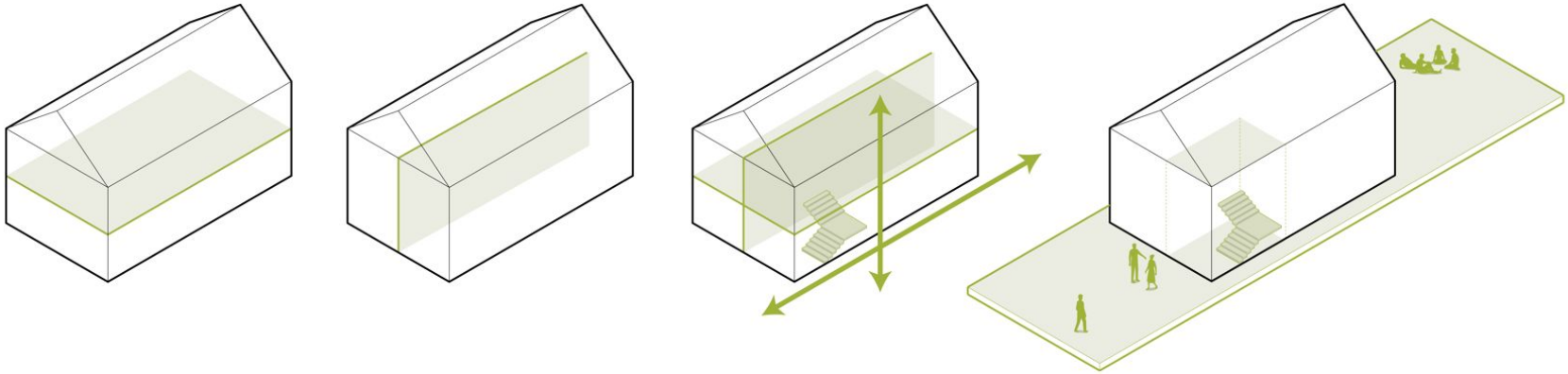
Design Strategies

Two-Floor Split

Bisecting Wall

Densification &
Front-to-Back access

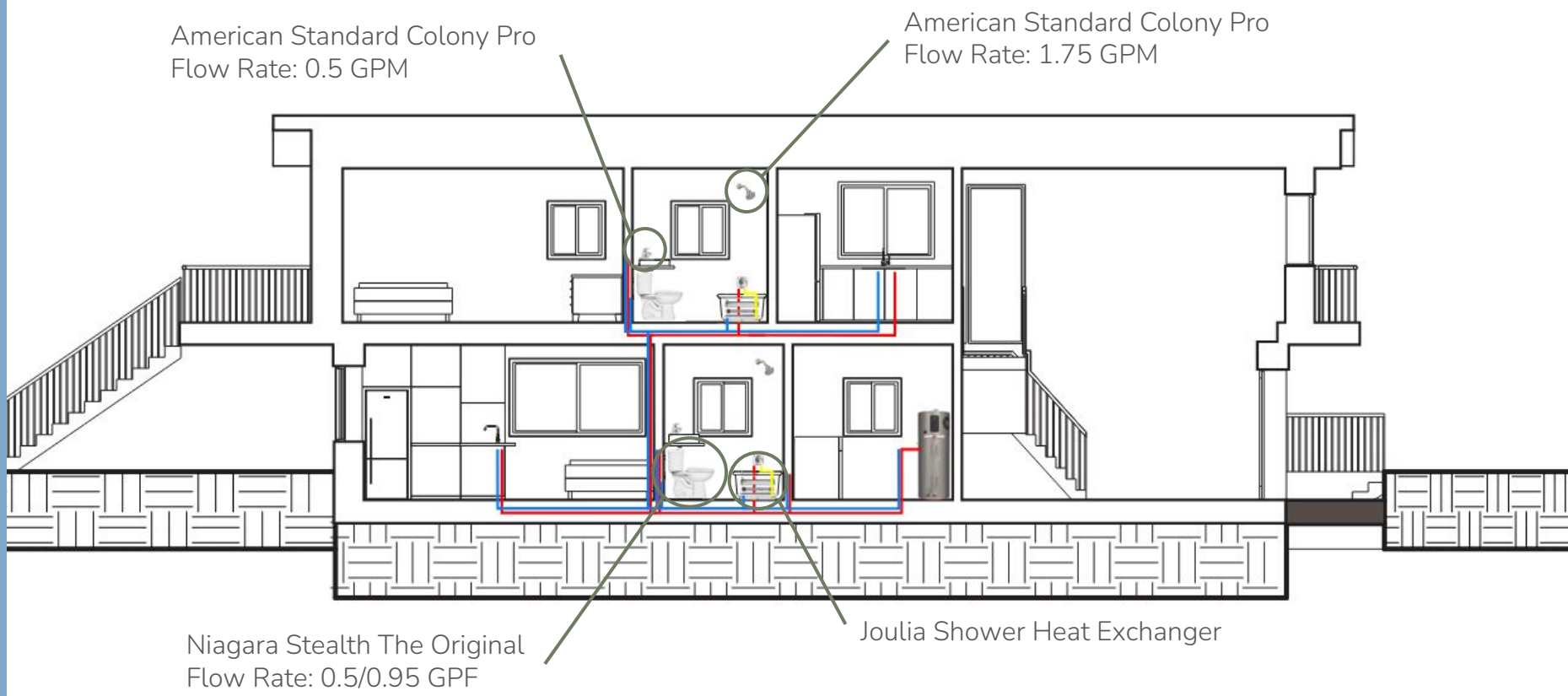
Communal Activation



Original Conditions

Design Operation

PLUMBING

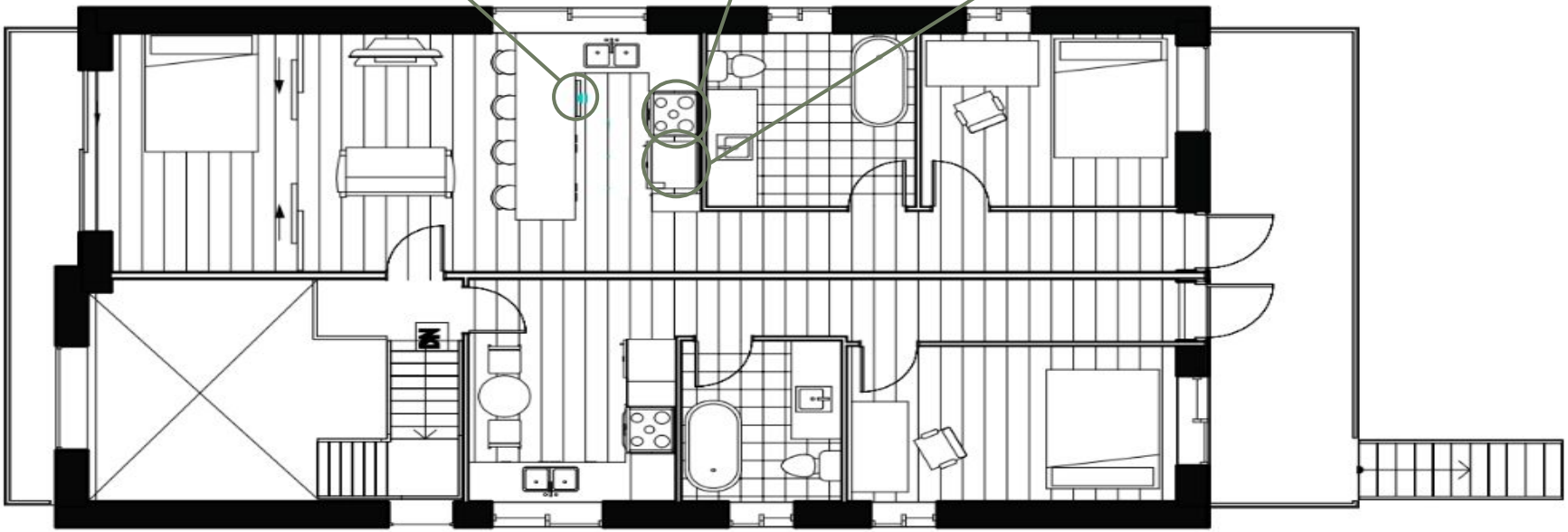

American Standard Colony Pro
Flow Rate: 0.5 GPM
American Standard Colony Pro
Flow Rate: 1.75 GPM
Niagara Stealth The Original
Flow Rate: 0.5/0.95 GPF
Joulia Shower Heat Exchanger

APPLIANCES

Samsung Dishwasher
Energy Use: 239 kWh/yr

LG Stove
Energy Use: 189 kWh/yr

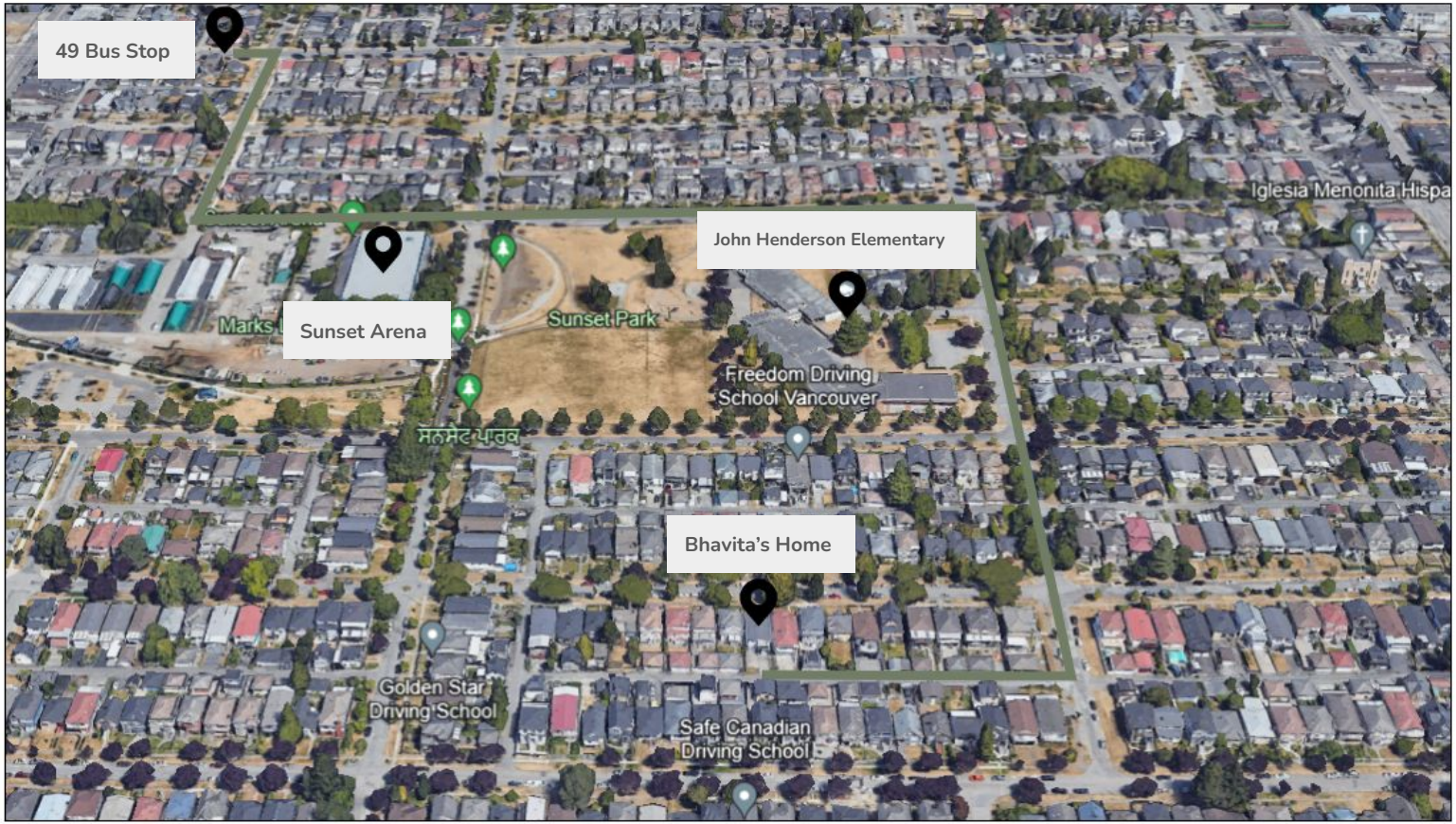
Insignia Refrigerator
Energy Use: 369 kWh/yr



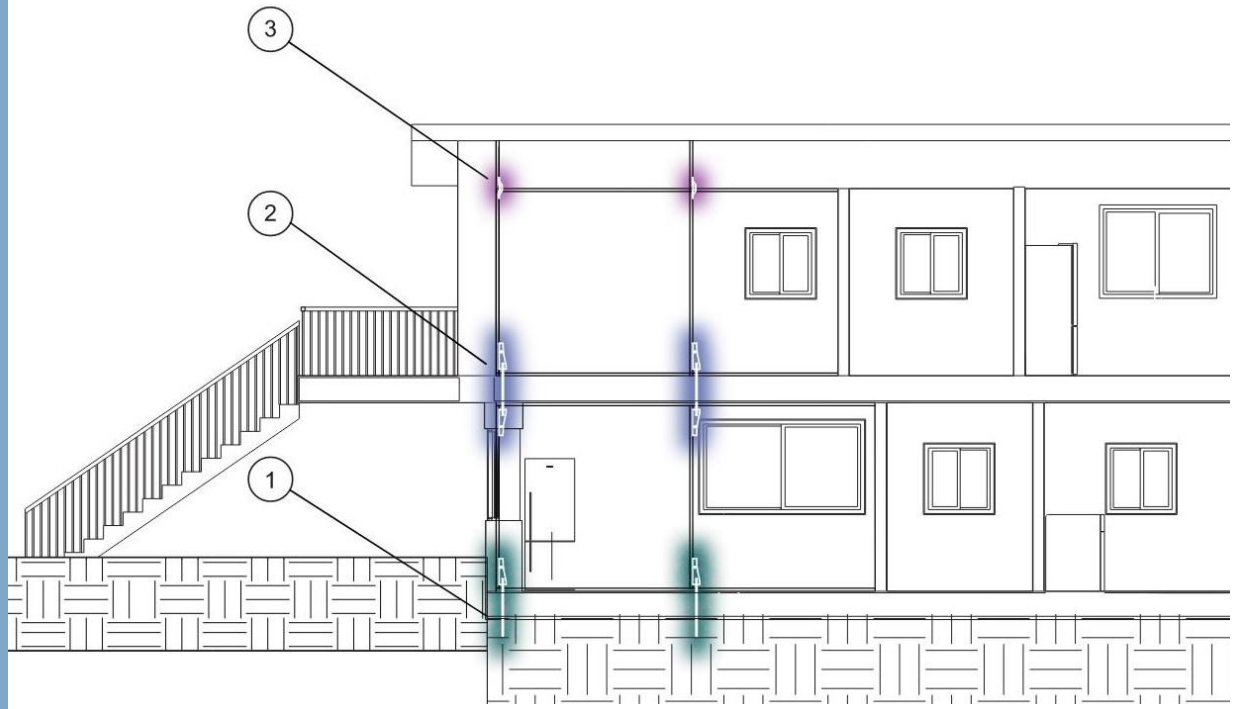
Bhavita's Day

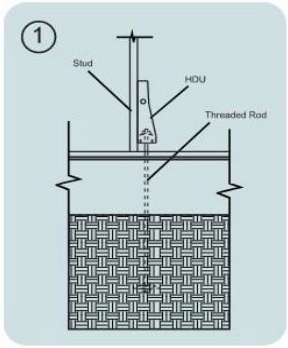
ATRIUM

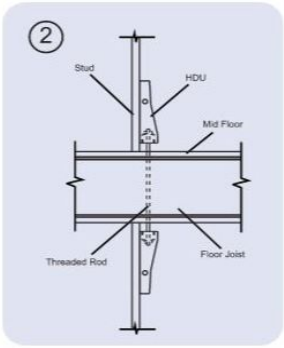
SITE ANALYSIS

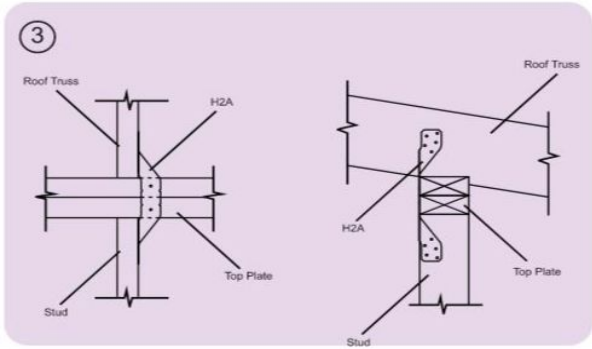


STRUCTURAL

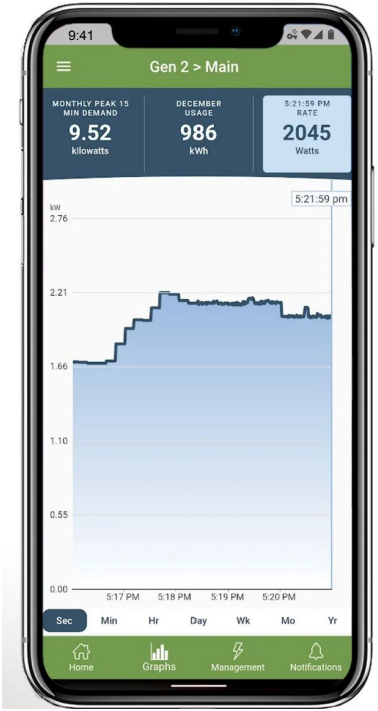

3
2
1


1
Stud
HDU
Threaded Rod


2
Stud
HDU
Mid Floor
Threaded Rod
Floor Joist


3
Roof Truss
H2A
Top Plate
Stud
Roof Truss
H2A
Top Plate
Stud

ENERGY MANAGEMENT & CONTROLS



Emporia Energy Clamp-Based Energy Usage Application

Source: Amazon

Rheem Heat Pump Hot Water Heater Application

Source: Rheem

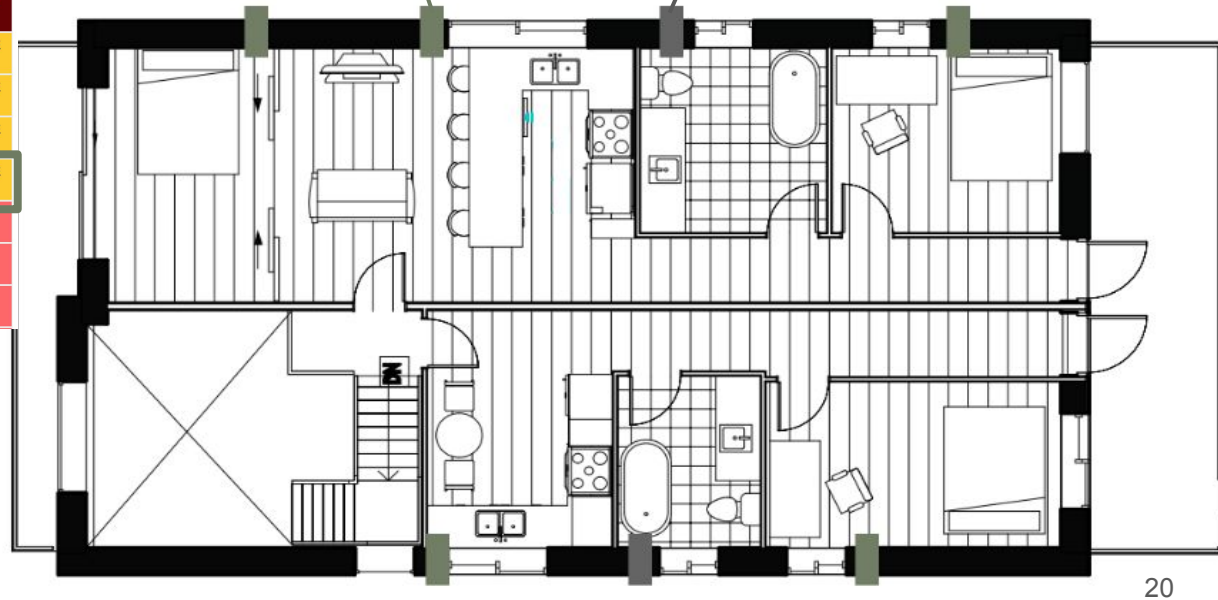
VENTILATION

Station	Current	Maximum AQHI Forecast* Today	Tonight	Tomorrow
Castlegar Aug. 22, 2018, 09:00am PDT	VERY HIGH 10+	VERY HIGH 10+	VERY HIGH 10+	HIGH 8
Comox Valley Aug. 22, 2018, 09:00am PDT	HIGH 10	VERY HIGH 10+	VERY HIGH 10+	MODERATE 5
Duncan Aug. 22, 2018, 09:00am PDT	HIGH 7	VERY HIGH 10+	VERY HIGH 10+	MODERATE 5
Fort St. John Aug. 22, 2018, 09:00am PDT	VERY HIGH 10+	VERY HIGH 10+	VERY HIGH 10+	VERY HIGH 10+
Fraser Valley (Central) Aug. 22, 2018, 08:00am PDT	HIGH 9	VERY HIGH 10+	VERY HIGH 10+	HIGH 7
Fraser Valley (Eastern) Aug. 22, 2018, 08:00am PDT	VERY HIGH 10+	VERY HIGH 10+	HIGH 10	HIGH 8
Kamloops Aug. 22, 2018, 09:00am PDT	MODERATE 4	MODERATE 6	HIGH 9	VERY HIGH 10+
Metro Vancouver (North East) Aug. 22, 2018, 08:00am PDT	HIGH 8	VERY HIGH 10+	HIGH 10	MODERATE 5
Metro Vancouver (North West) Aug. 22, 2018, 08:00am PDT	MODERATE 5	VERY HIGH 10+	HIGH 10	MODERATE 5
Metro Vancouver (South East) Aug. 22, 2018, 08:00am PDT	HIGH 10	VERY HIGH 10+	HIGH 10	MODERATE 5
Metro Vancouver (South West) Apr. 20, 2024, 10:00am PDT	VERY HIGH 10+	VERY HIGH 10+	HIGH 10	MODERATE 5
Nanaimo / Parksville Aug. 22, 2018, 09:00am PDT	VERY HIGH 10+	VERY HIGH 10+	VERY HIGH 10+	HIGH 7
Okanagan (Central) Aug. 22, 2018, 09:00am PDT	MODERATE 5	VERY HIGH 10+	VERY HIGH 10+	HIGH 7
Okanagan (North) Aug. 22, 2018, 09:00am PDT	MODERATE 6	VERY HIGH 10+	VERY HIGH 10+	HIGH 7

Source: 604now

Lunos e2 HRV

Lunos ego HRV



RENTAL COST

$3,500
/month

Unaffordable

2-Bedroom Market Price

$2,400
/month

Affordable rate
set by CMHC

2-Bedroom Price
Vancouver Special 2.0

ENERGY COST

BC Hydro
Power smart

Prepared For
BHAVITA
3-450 E 54 AVE
VANCOUVER, BC, V5Y 1G2

Customer Service

Invoice Number
123456

Meter Reading Information		
Energy Usage		
Meter #		3450
	1-Feb	22400
	31-Mar	22898
59 days		498
Energy Generation		
Solar PV #		3450
	1-Feb	18912
	31-Mar	19474
59 days		562

Pay by: APR 30 2024 — **Please Pay: $10.36**

Billing Date:	APRIL 20 2024
Billing Period:	FEB 01 2024 to MAR 31 2024

Power Out? 1-800 BCHYDRO
Mail to: BC Hydro, PO Box 8910
Vancouver, BC, V6B 4X3

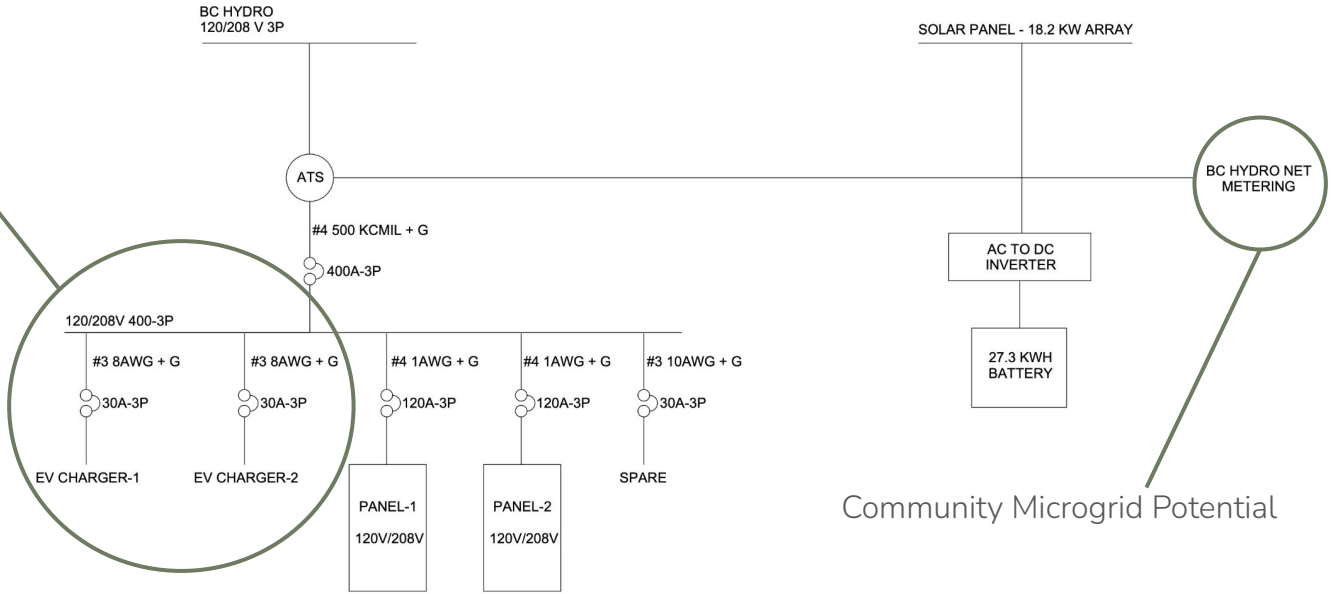
PREVIOUS BILLING PERIOD		
Previous bill		$16.85
Payment received Feb-28-2024 - Thank you		$16.85
BALANCE FORWARD		**$0.00**
ELECTRICITY CHARGES		
Based on Residential Conservation Rate 1101		
Feb 1, 2024 to Mar 31, 2021 (498 kWh used, 562 kWh generated)		
Basic Charge:	59 days @ $0.2117/day	$12.49
ENERGY CHARGES		
Step 1:	-64 kWh @$0.0975/kWh	-$6.24
Step 2:	0 kWh @ $0.1408/kWh	$0.00
Rate rider -1%		-$0.06
Regional transit levy:	59 days @ 0.06240/day	$3.68
TAXES ON ELECTRICITY CHARGES		
GST 5% on $153.47		$0.49
TOTAL DUE		**$10.36**

You saved 97% on your energy bill by by generating your own electricity!

BACKYARD COMMUNITY GARDEN

ELECTRIC VEHICLE CHARGING

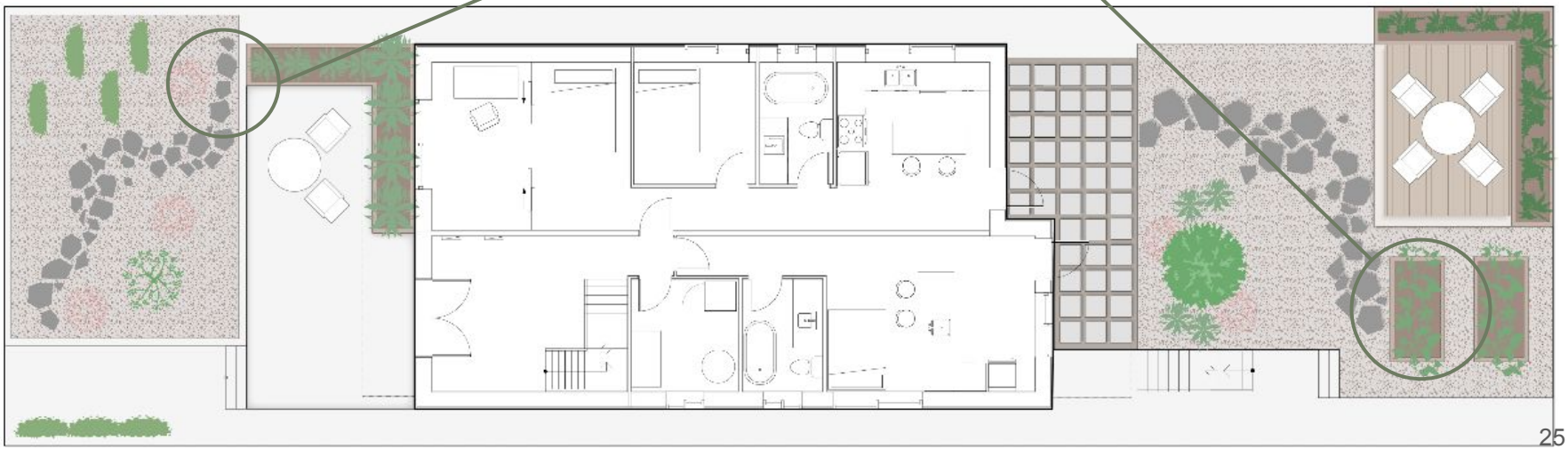
Source: Electrify Canada



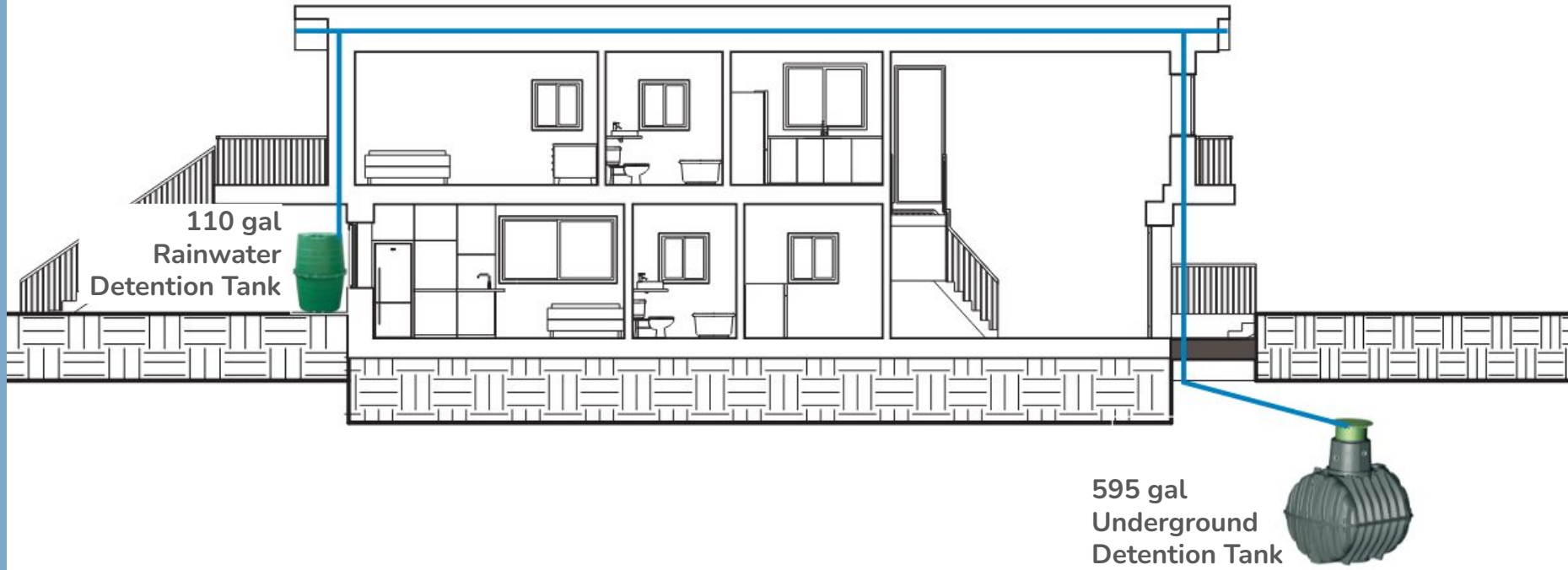
REPURPOSING OF ORIGINAL FACADE

Red Brick

Wood



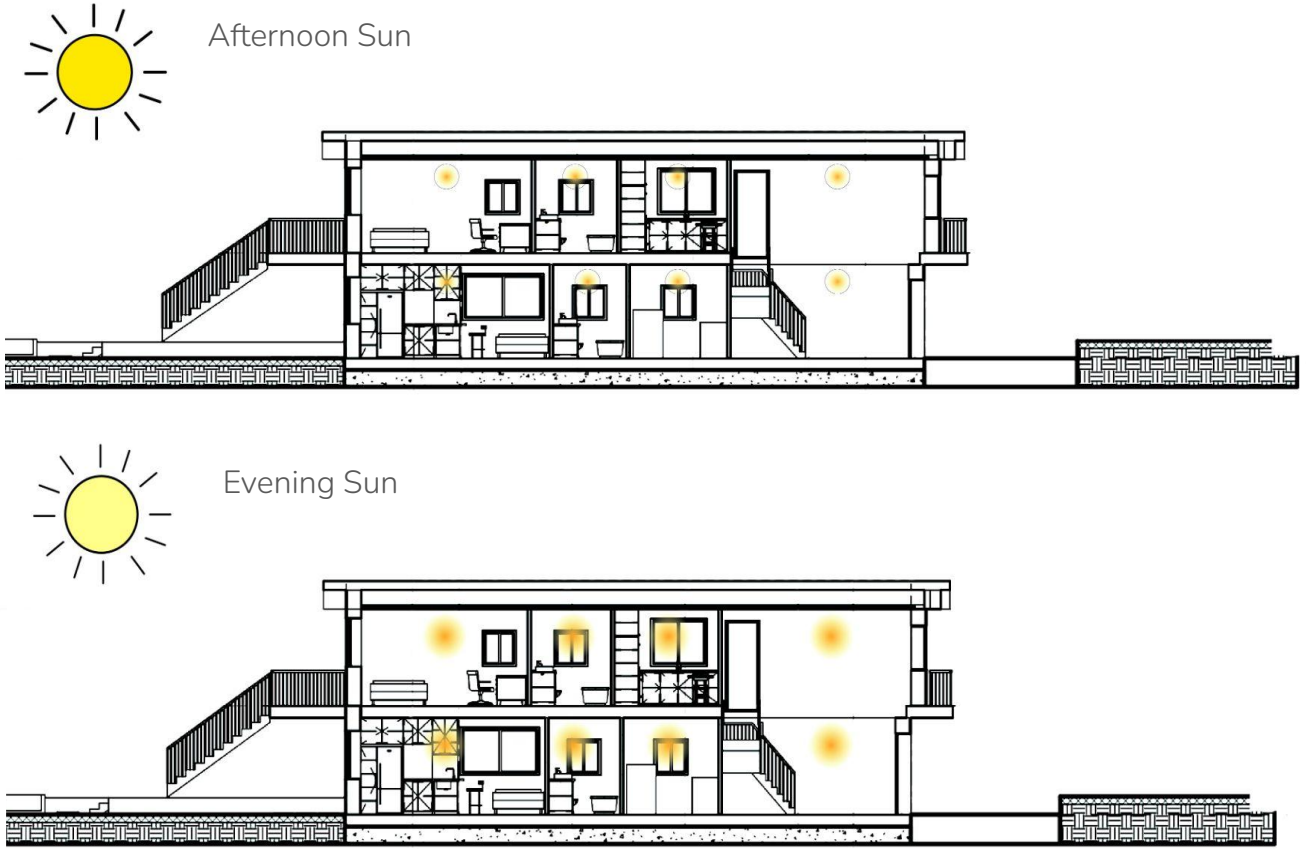
RAINWATER MANAGEMENT



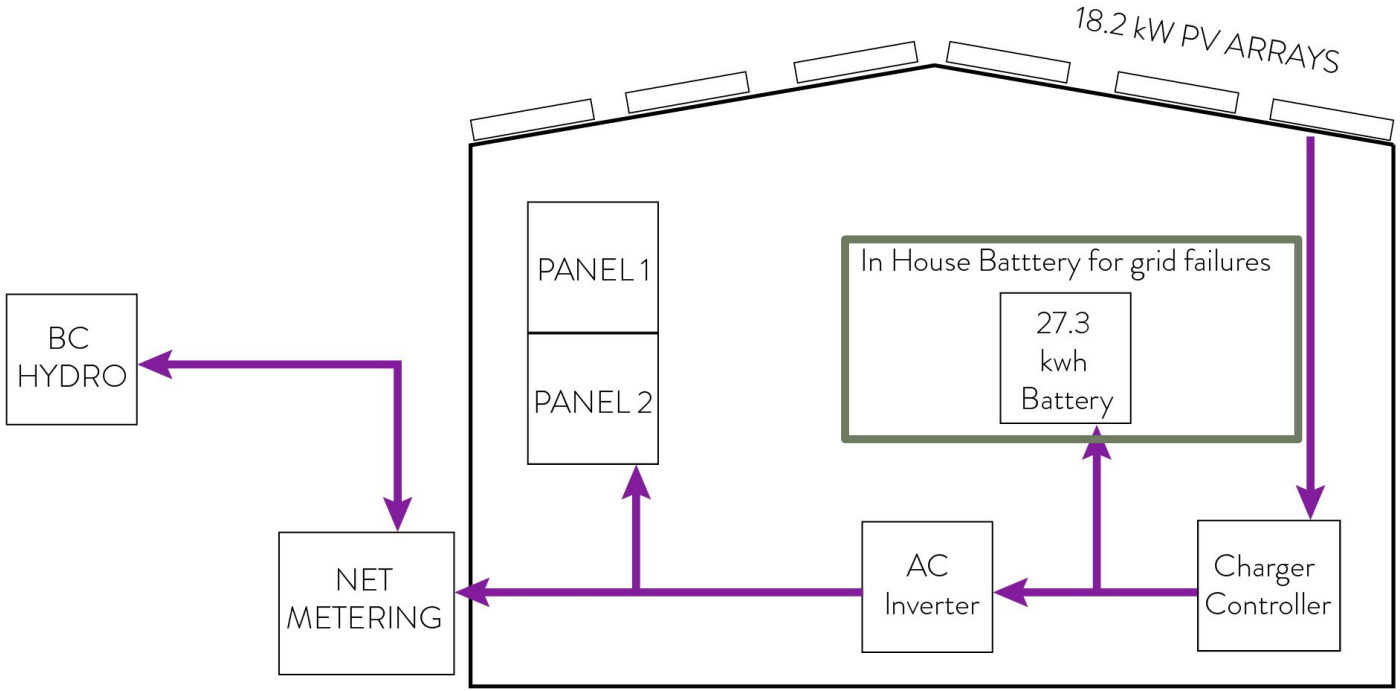
INTERIOR DESIGN

Bhavita's Day

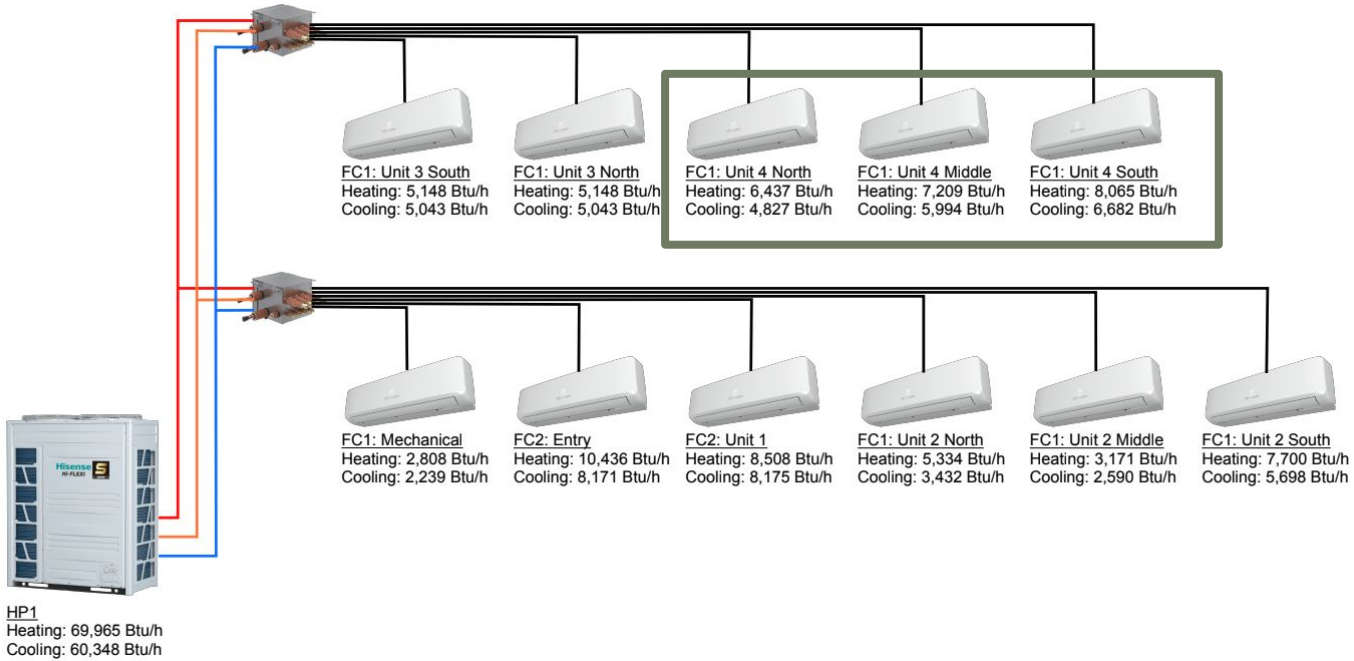
LIGHTING & DAYLIGHT HARVESTING



BUILDING ENERGY SYSTEM



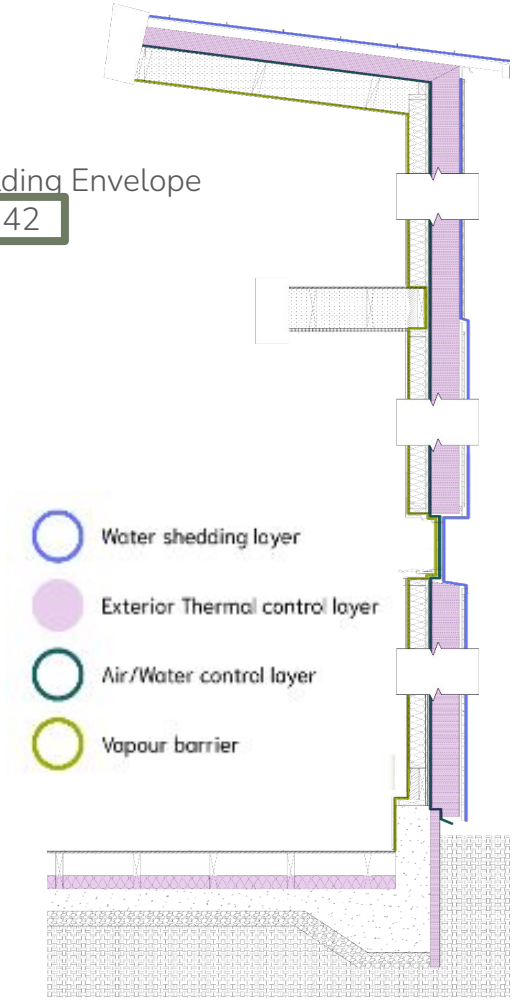
HEATING & COOLING



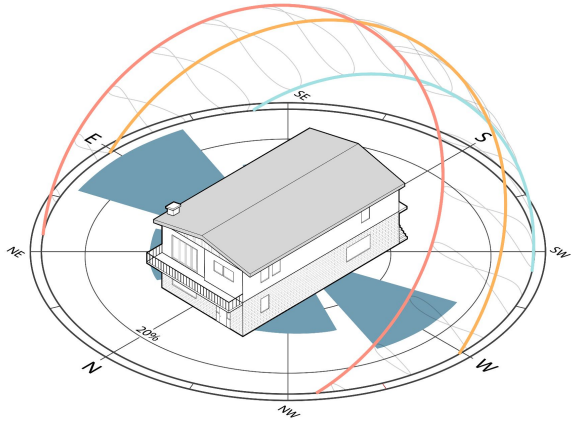
BUILDING ENCLOSURE

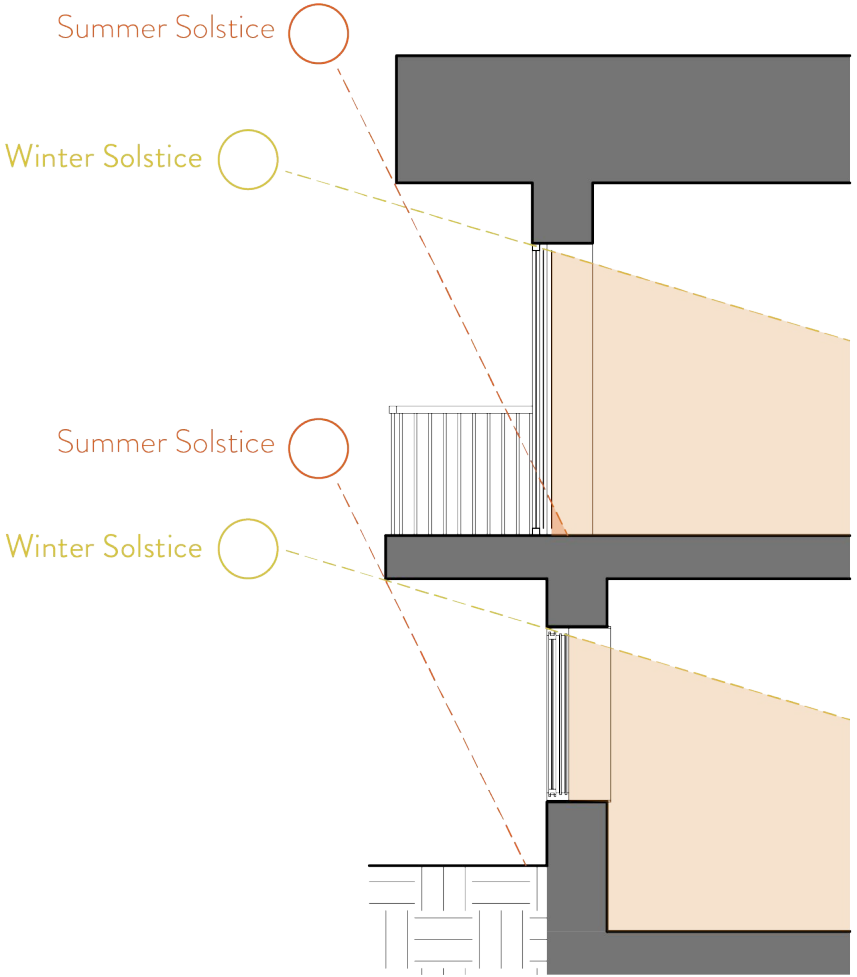
Ecoline Triple-Pane Windows
U = 0.2

Building Envelope
R = 42



PASSIVE DESIGN



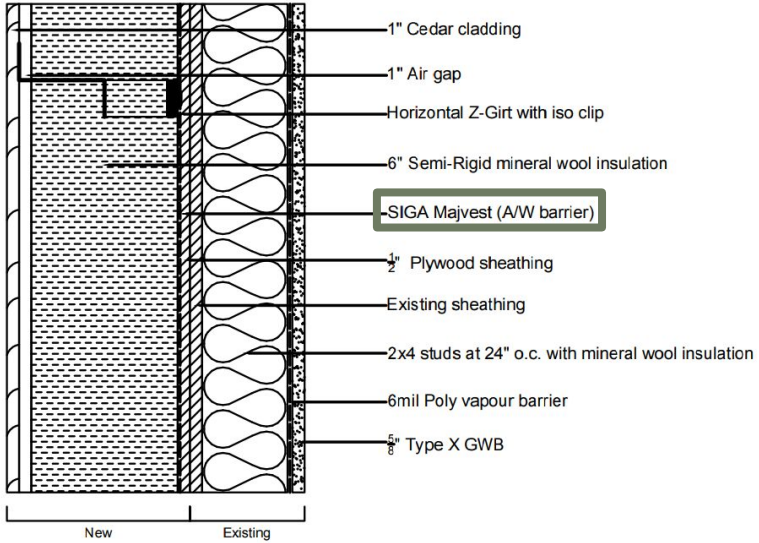


Bhavita's Day

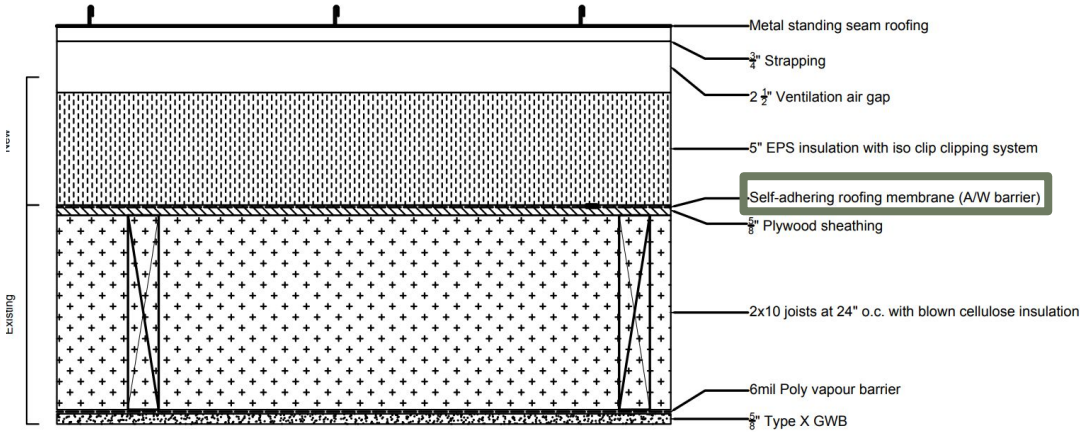
OCCUPANCY SENSORS

Bhavita's Day

BUILDING ENVELOPE

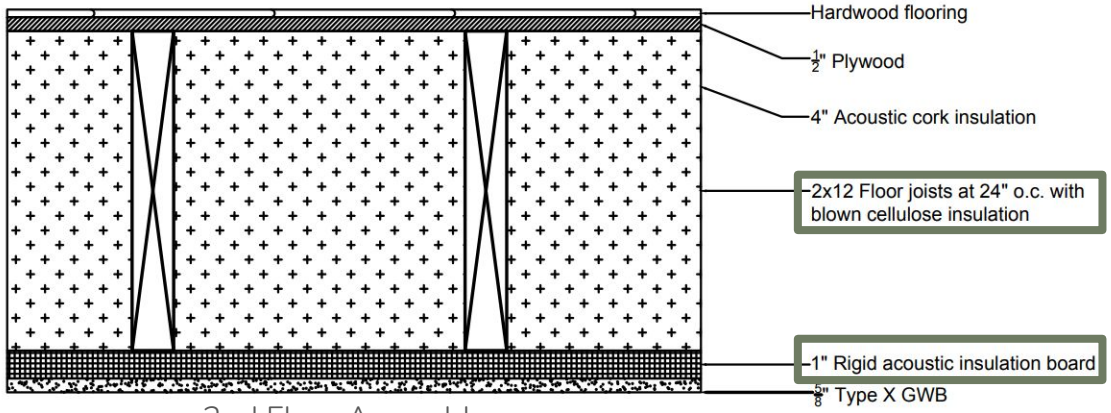


Wall Assembly

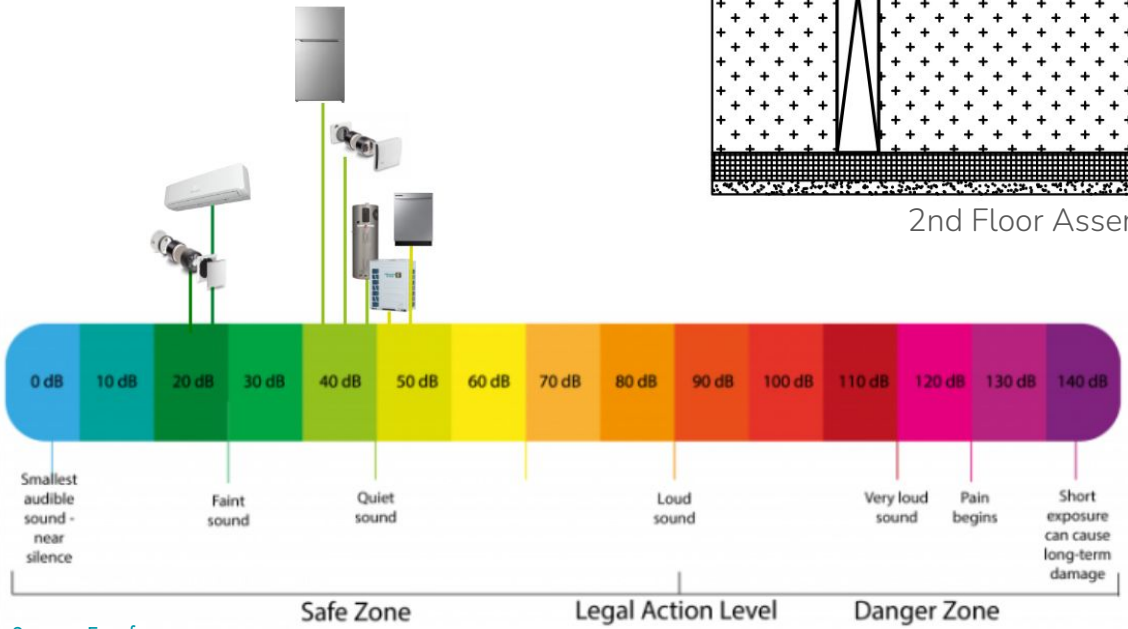


Roof Assembly

ACOUSTICS



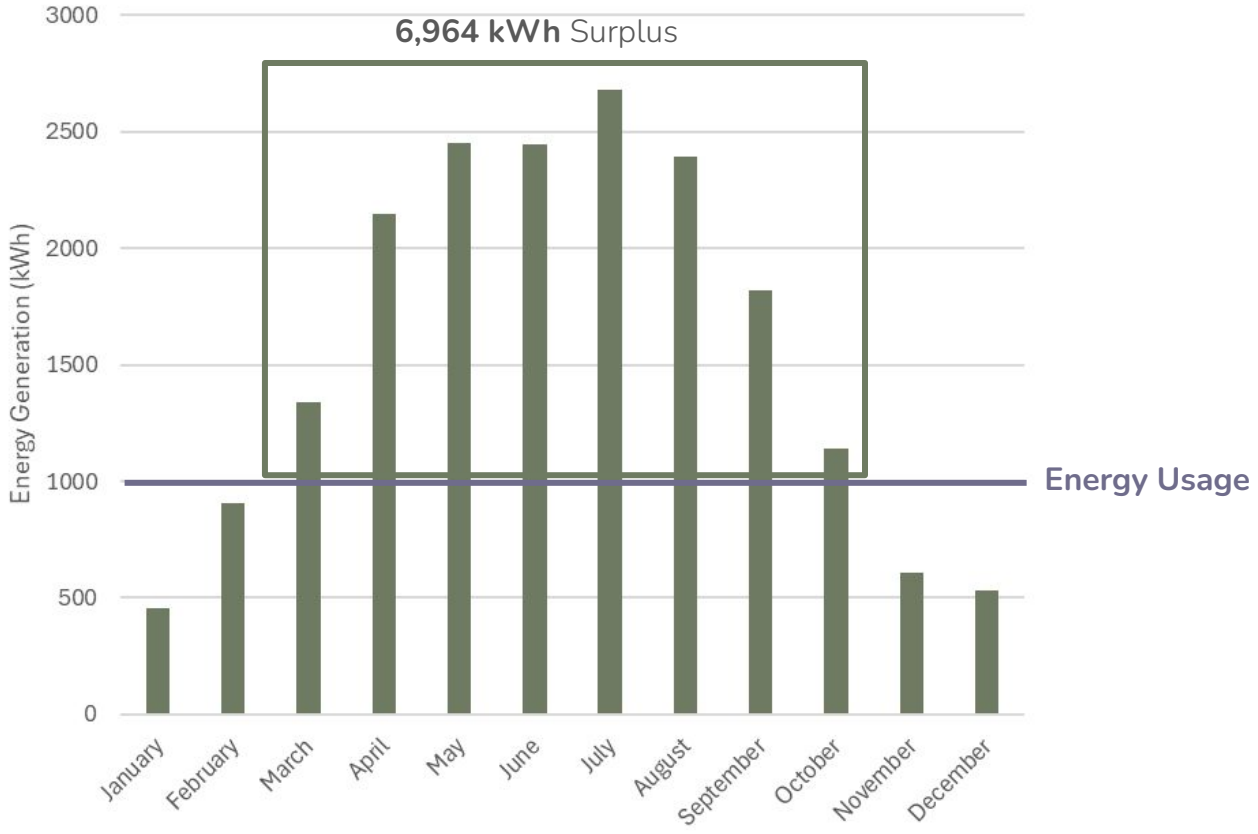
2nd Floor Assembly



Source: Ensafe

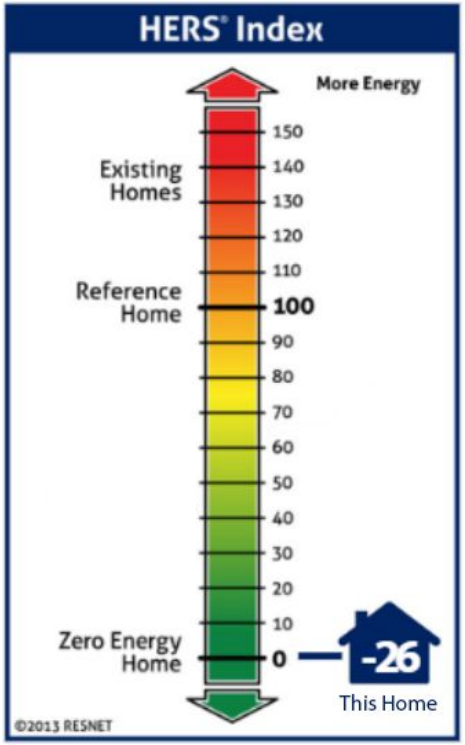
10,000 Vancouver Specials

RENEWABLE ENERGY

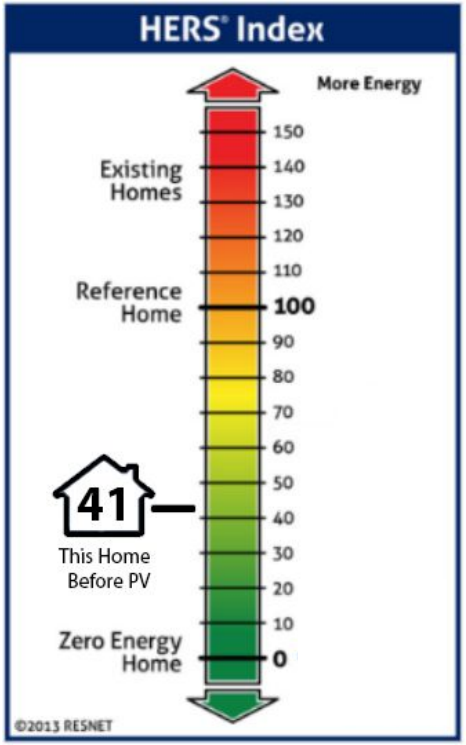


Building Performance

ENERGY PERFORMANCE



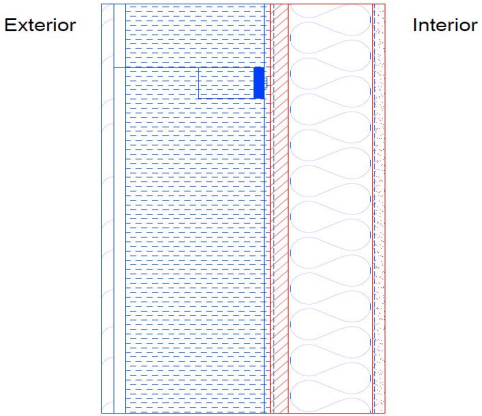
With Solar Energy Generation



Without Solar Energy Generation

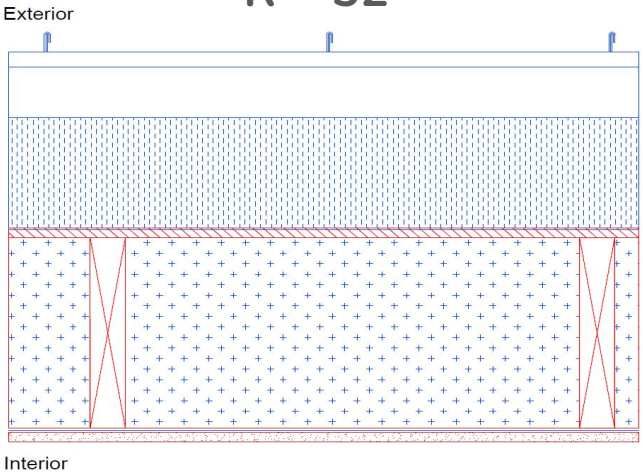
BUILDING ENVELOPE

Walls
R = 42



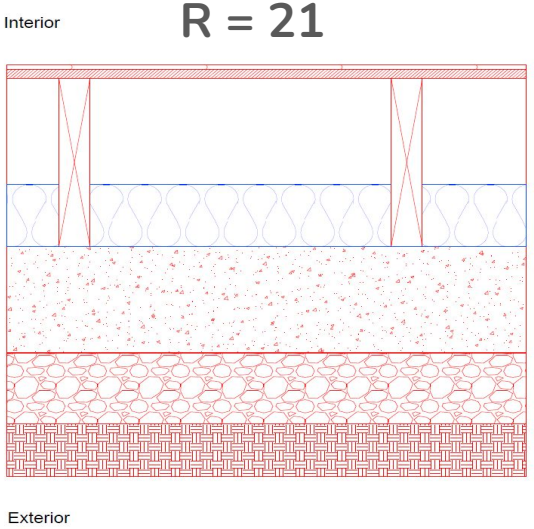
New	Existing/ Recovered
Insulation Weather & Vapour Barriers Z-Girts and Cladding	Wood Frame Sheathing Gypsum

Roof
R = 52



New	Existing/ Recovered
Insulation Weather & Vapour Barriers Metal Roofing	Joists Sheathing Gypsum

Slab
R = 21



New	Existing/ Recovered
Insulation	Slab Floor Joists Hardwood Flooring

EMBODIED CARBON

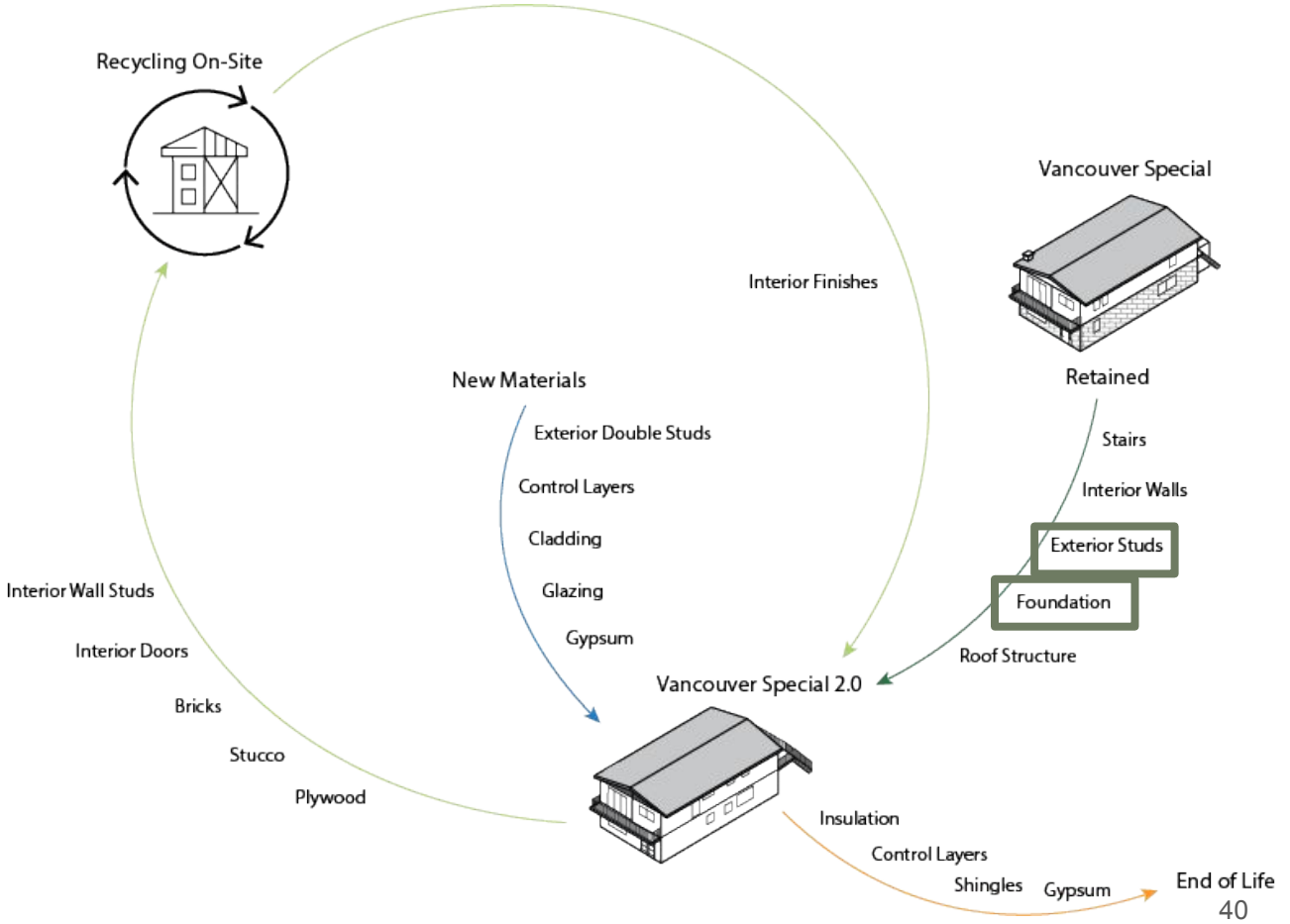
New Build

67 Tonnes CO_2e

37% Reduction

Vancouver Special 2.0

42 Tonnes CO_2e

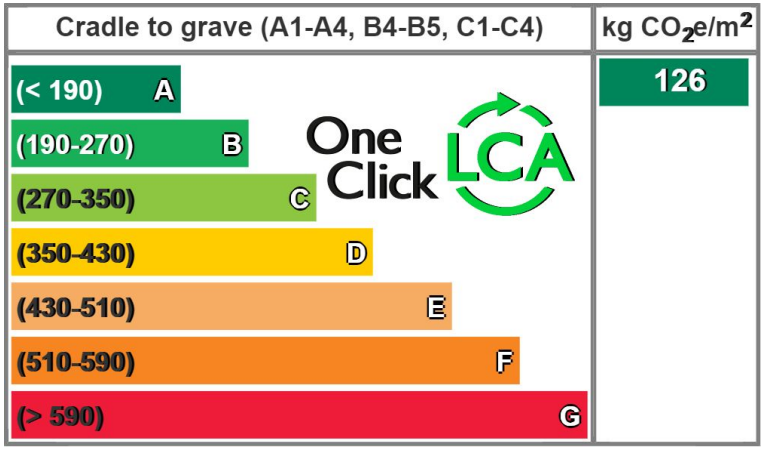


LIFE CYCLE ASSESSMENT

42 Tonnes CO_2e

30.04 kg CO_2e / m^2 / year

Net-Zero Carbon by **2066**



Ekotrope Energy Consumption Results (Mbtu/yr)	40.8
On-Site Generation (Mbtu/yr)	66.8
BC Emissions Factor tCO2e/MBtu	0.03856
GHGI tCO2e/yr	-1.00256

Vancouver Special 2.0

Third Quadrant Design
University of British Columbia

Thank You!


THIRD.SPACE


CITY OF
VANCOUVER


PONTEM
GROUP


LEDCOR
GROUP


Anthem


COWI


wsp


DIALOG

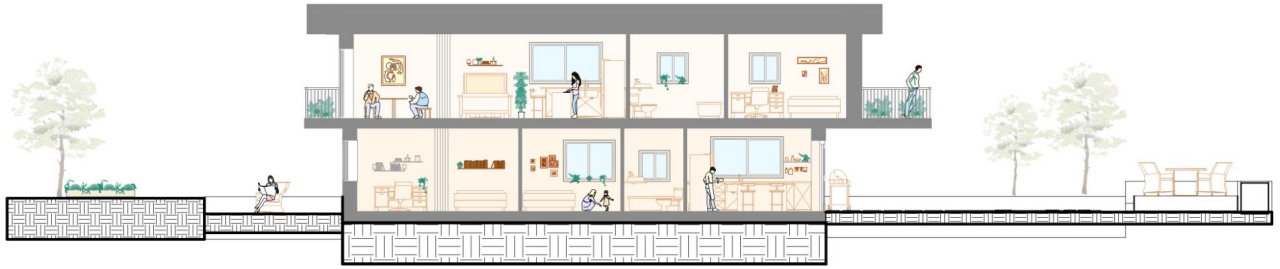

RDH
BUILDING
SCIENCE


Stantec

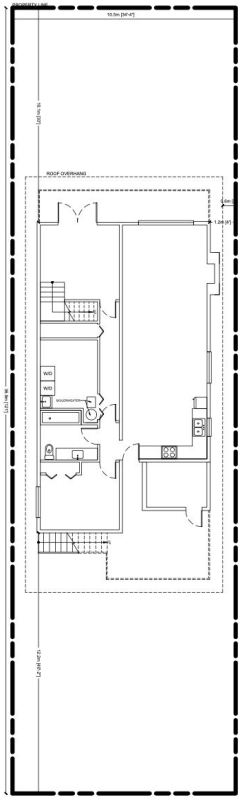
APPENDIX

LIVING ROOM RENDER

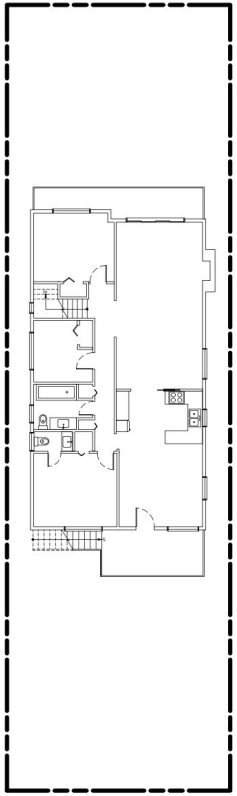
SECTION RENDERS



EXISTING FLOOR PLANS



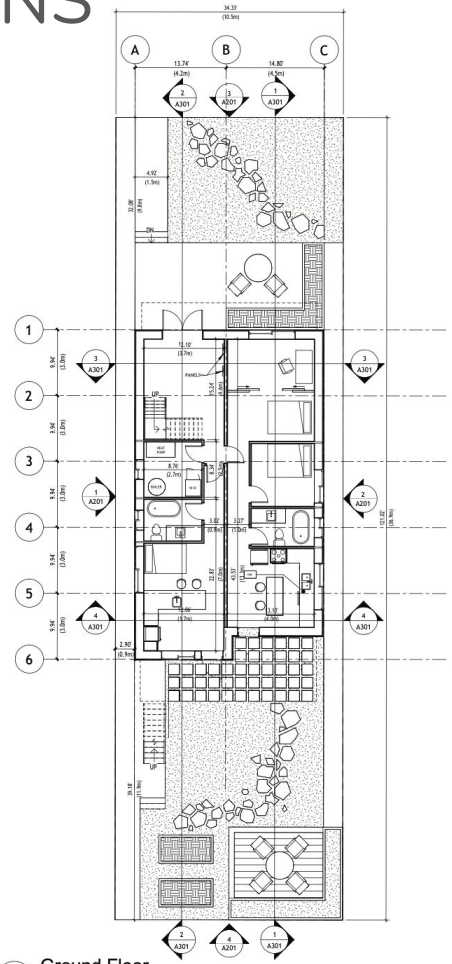
1 / A101 Ground Floor
1 : 100



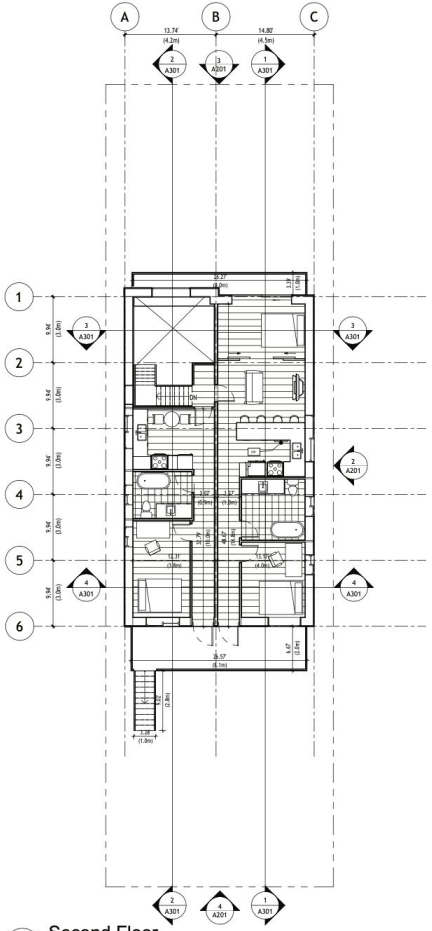
2 / A101 Second Floor
1 : 100

Appendix

FLOOR PLANS



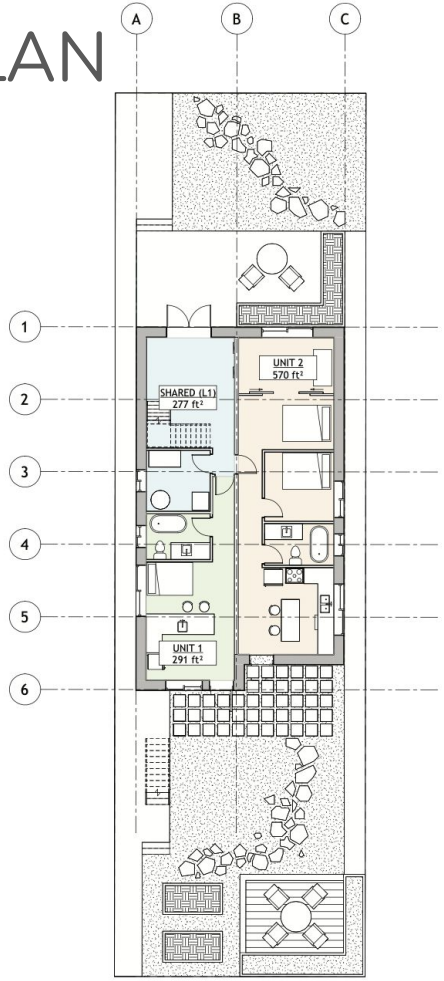
1 A101 Ground Floor
1 : 100



2 A101 Second Floor
1 : 100

Appendix

AREA PLAN

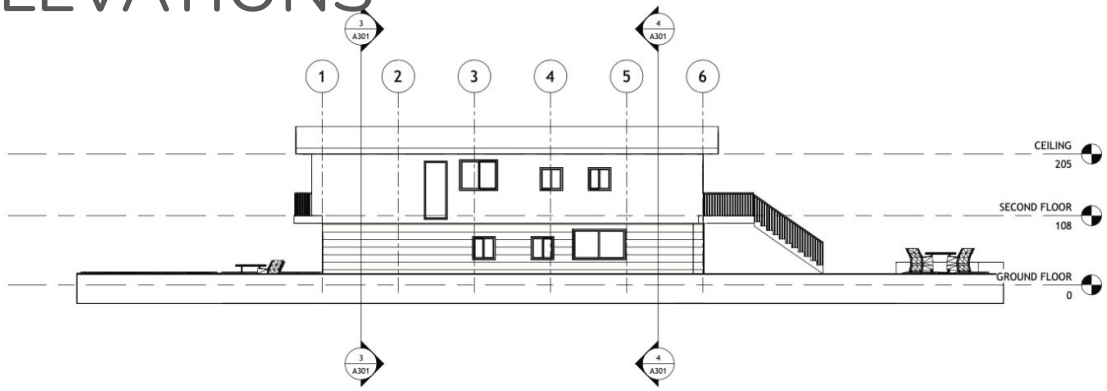


1 A102 GROUND FLOOR
1 : 100

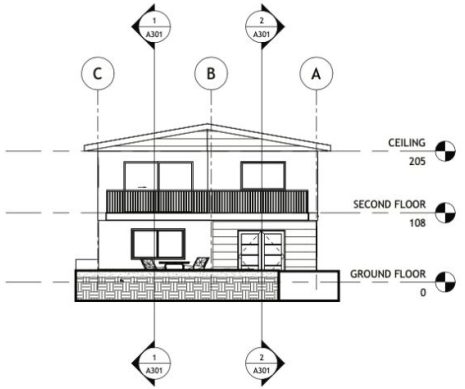
2 A102 SECOND FLOOR
1 : 100

Appendix

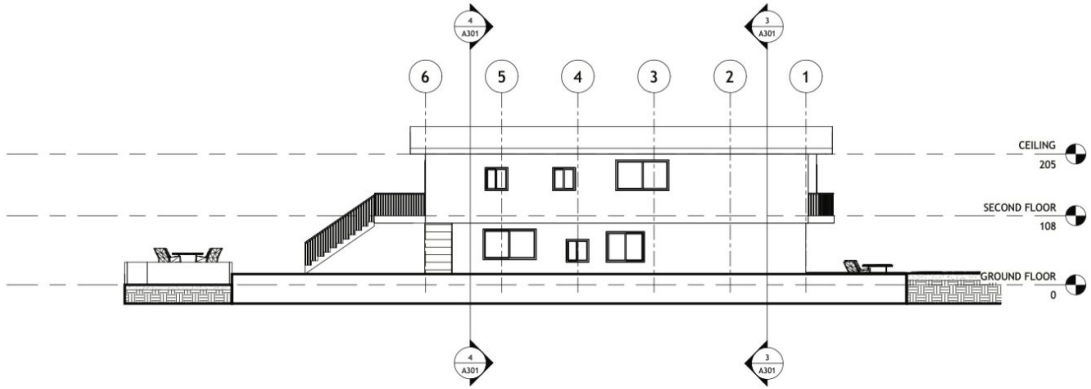
ELEVATIONS



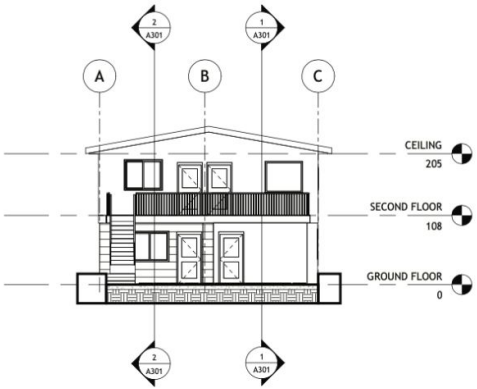
1 A201 West Elevation
1 : 100



3 A201 North Elevation
1 : 100



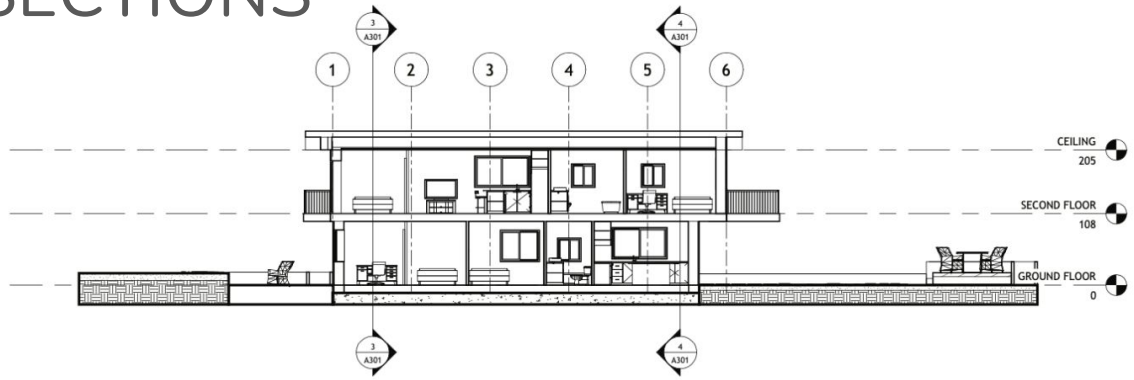
2 A201 East Elevation
1 : 100



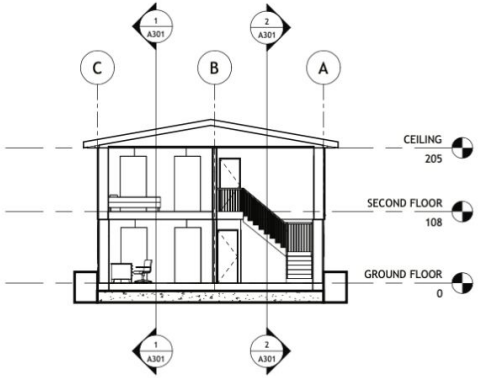
4 A201 South Elevation
1 : 100

Appendix

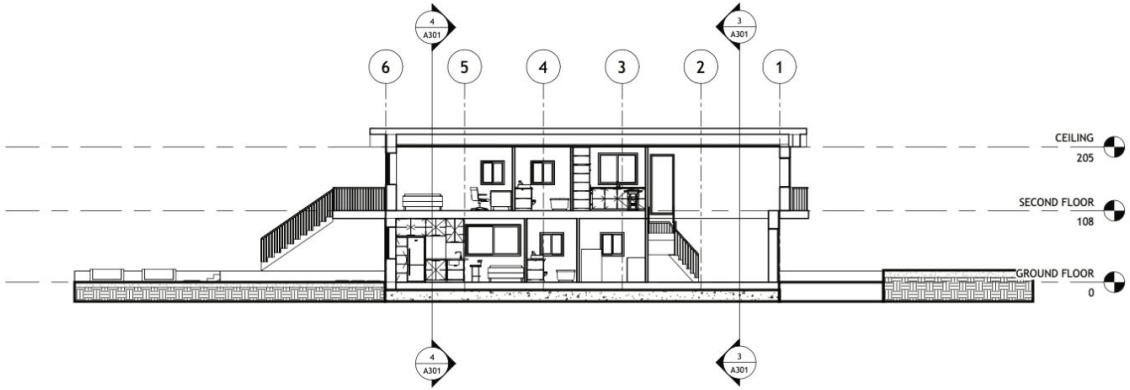
SECTIONS



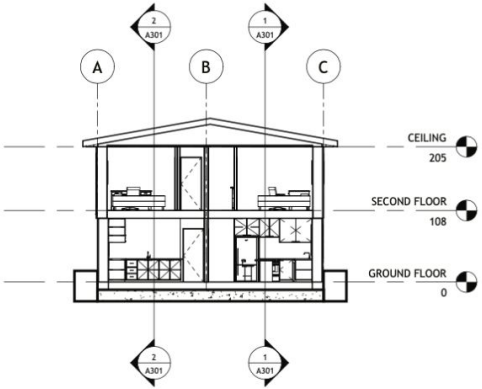
1 A301 West Section
1 : 100



3 A301 North Section
1 : 100



2 A301 East Section
1 : 100



4 A301 South Section
1 : 100

VEGETATION SELECTION

Sword Fern

Polystichum munitum
Hardiness Zone: 3-8
Season of interest: all seasons
Height: 2'-4'
Spread: 2'-4'
Tolerance: Full shade
Water Needs: Average
Maintenance: Low

Pacific Rhododendron

Rhododendron macrophyllum
Hardiness Zone: 6-9
Season of interest: Spring, Summer
Height: 4'-15'
Spread: 4'-12'
Tolerance: N/A
Water Needs: Average
Maintenance: Low

Japanese Maple

Acer palmatum
Hardiness Zone: 5-9
Season of interest: Fall
Height: 4'-25'
Spread: 4'-25'
Tolerance: N/A
Water Needs: Low
Maintenance: Low

Red Flowering Currant

Ribes sanguineum
Hardiness Zone: 6-8
Season of interest: Spring,Fall
Height: 5'-12'
Spread: 5'-12'
Tolerance: Drought
Water Needs: Low
Maintenance: Low

Pacific Dogwood

Cornus nuttallii
Hardiness Zone: 7-9
Season of interest: Spring, Summer, Fall
Height: 15'-40'
Spread: 10'-25'
Tolerance: N/A
Water Needs: Low
Maintenance: Low

Lettuce

Lactuca sativa
Hardiness Zone: 2-11
Season of interest: Spring, Summer, Fall
Height: 6"-1'
Spread: 6"-1'
Tolerance: N/A
Water Needs: Average
Maintenance: Low

California Lilac

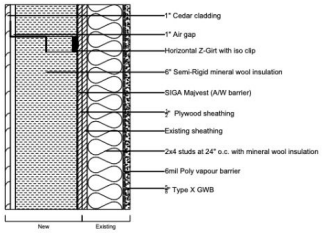
Ceanothus 'Victoria' thyrsiflorus
Hardiness Zone: 7-10
Season of interest: Spring, Summer
Height: 4"-6'
Spread: 9"-12"
Tolerance: Drought
Water Needs: Low
Maintenance: Average

Kale

Brassica oleracea
Hardiness Zone: 2-11
Season of interest: Spring, Summer
Height: 1'-2'
Spread: 1'-2
Tolerance: N/A
Water Needs: Average
Maintenance: Low

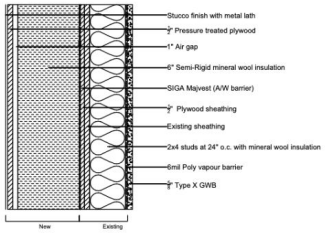
ENVELOPE DETAILS

Wall Assemblies



New Wood Cladding & Insulation on Existing Structure

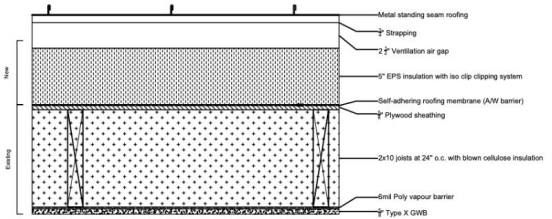
Material	Thickness (in)	Nominal R-Value (ft2 °F h/BTU)/in
Cedar cladding	0.500	0.62
Horizontal Z-girt with iso clips in air gap	1.000	1.00
Rockwool ComfortBoard 80	6.000	4.15
SIGA Majvest weather barrier	0.020	-
Plywood sheathing	0.500	1.25
Existing sheathing	0.500	0.62
Rockwool ComfortBatt	3.500	4.15
6mil poly vapour barrier	0.040	-
Type X Gypsum wall board	0.625	0.89
Total	12.891	42.56



New Stucco Cladding & Insulation on Existing Structure

Material	Thickness (in)	Nominal R-Value (ft2 °F h/BTU)/in
Stucco on lath	0.875	0.22
Pressure treated plywood	0.500	1.25
Air gap with clips	0.500	1.00
SIGA Majvest weatherboard 80	6.000	4.15
SIGA Majvest weather barrier	0.020	-
Plywood sheathing	0.500	1.25
Existing sheathing	0.500	0.62
Rockwool ComfortBoard	3.500	4.15
6mil poly vapour barrier	0.040	-
Type X Gypsum wall board	0.625	0.89
Total	12.910	41.26

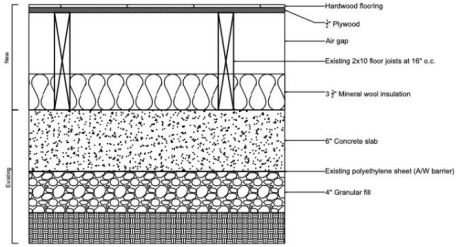
Roof Assembly



Existing Roof with New Insulation & Cladding

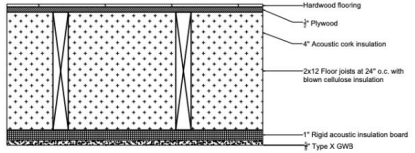
Material	Thickness (in)	Nominal R-Value (ft2 °F h/BTU)/in
Metal standing seam roof 24ga	0.015	0.61
½" Strapping	0.750	-
Air gap	2.000	1.00
EPS insulation with isoclips	4.000	4.00
Self-adhering roofing weather barrier	0.060	-
Plywood sheathing	0.500	1.25
Blown cellulose insulation	9.000	3.00
6mil poly vapour barrier	0.040	-
Type X gypsum wall board	0.625	0.56
Total	16.310	52.85

Floor Assemblies



Existing Foundation with New Flooring & Insulation

Material	Thickness (in)	Nominal R-Value (ft2 °F h/BTU)/in
Engineered heritage wood flooring	0.375	0.21
Plywood sheathing	0.500	1.25
Air gap between 2x10 floor joists	9.250	1.05
Rockwool ComfortBatt	3.500	4.15
6mil poly vapour barrier	0.040	0.10
Existing polyethylene air/water barrier	0.040	-
Granular fill	4.000	-
Total	16.32	21.77



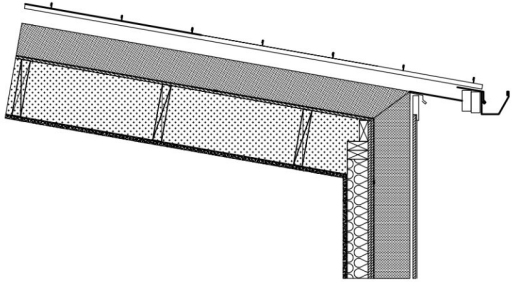
2nd Floor with New Flooring & Acoustic Insulation

Material	Thickness (in)	Nominal R-Value (ft2 °F h/BTU)/in
Engineered heritage wood flooring	0.275	0.11
Plywood sheathing	0.500	1.25
Existing floor joists insulation	9.250	3.00
Supreme acoustic rigid board	1.000	0.50
Type X gypsum wall board	0.625	0.50
Total	9.900	30.88

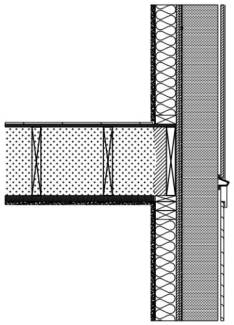
Appendix

CONNECTION DETAILS

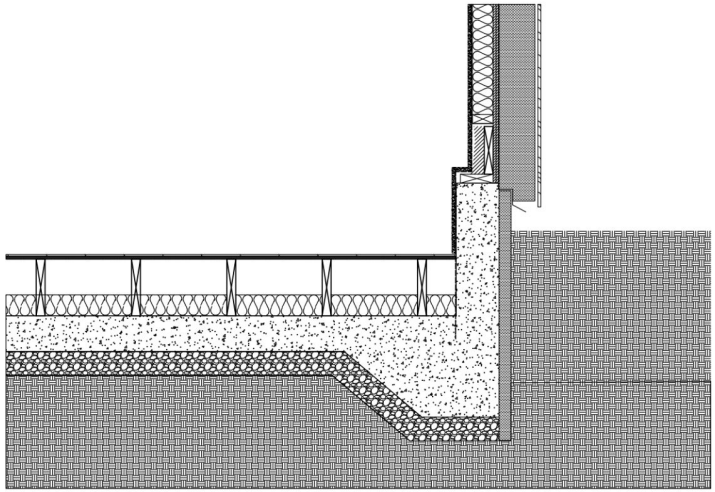
Roof to Wall Connection



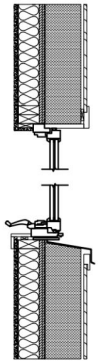
Wall to 2nd Floor Connection



Wall to Foundation Assembly

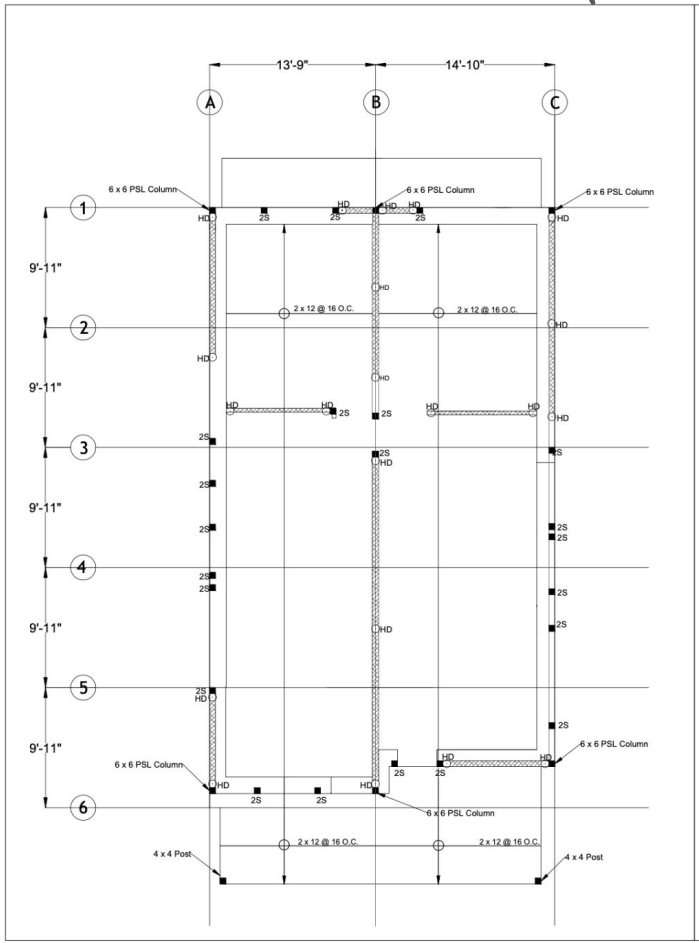


Wall to Window Connection

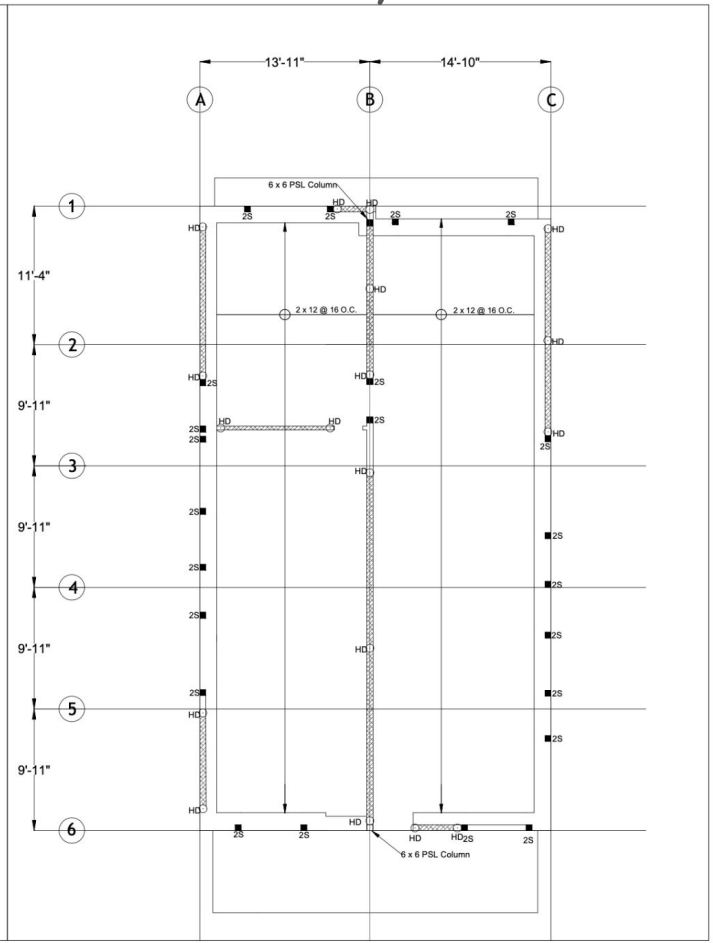


Appendix

STRUCTURAL PLANS (L2 AND ROOF)

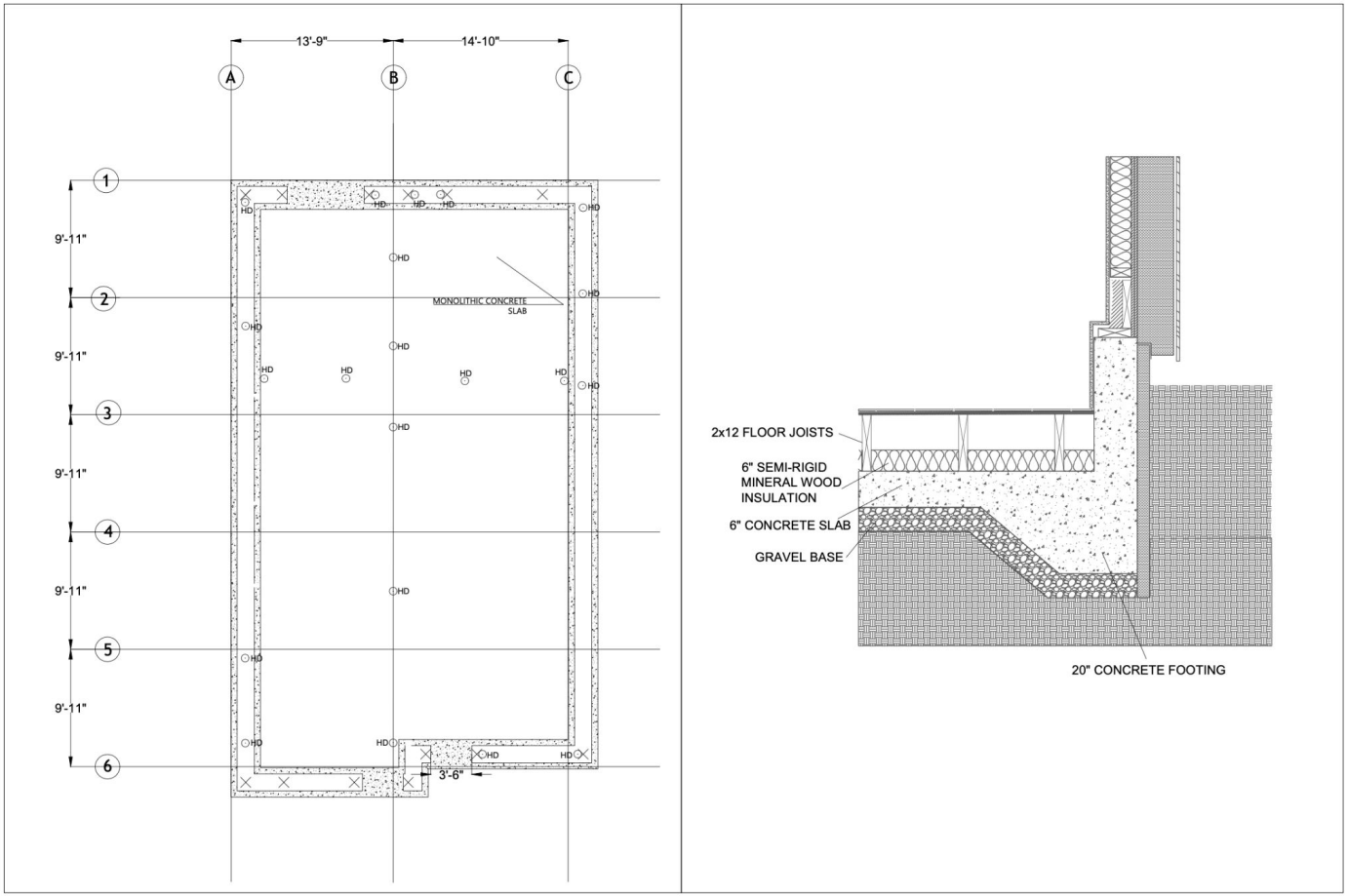


1 A101 LEVEL 2 FRAMING PLAN
1 : 50



2 A101 ROOF FRAMING PLAN
1 : 50

STRUCTURAL PLANS (FOUNDATION)

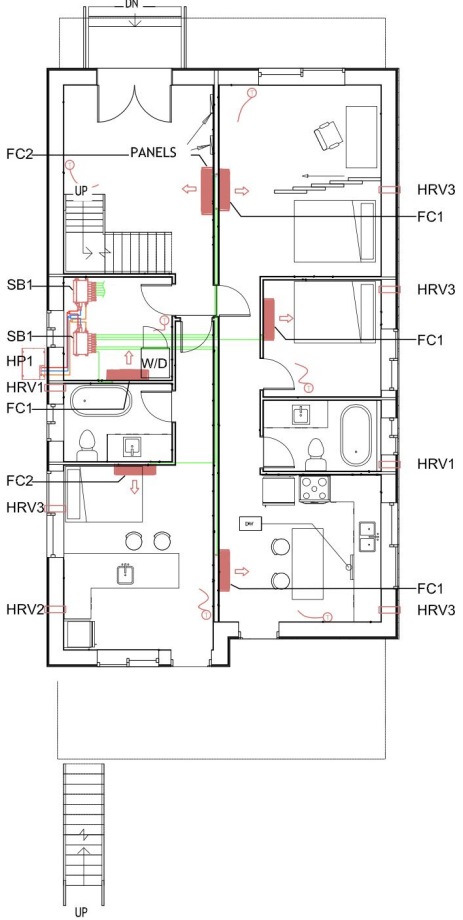


1 A101 FOUNDATION 1 : 50

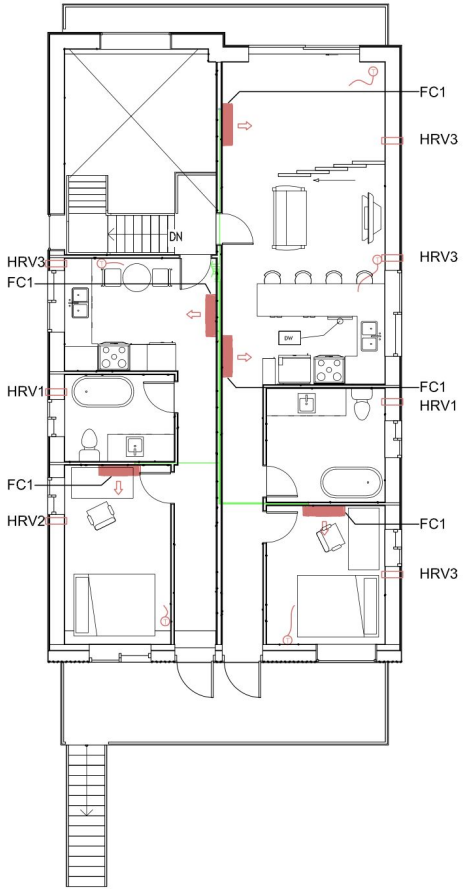
2 A101 DETAIL 1 : 8

Appendix

MECHANICAL PLANS



1 A101 Ground Floor
1 : 50



2 A101 Second Floor
1 : 50

Appendix

MECHANICAL SCHEDULES

HEAT EXCHANGERS		
LOCATION		WASHROOMS
SERVICE		SHOWER HEAT RECOVERY
MANUFACTURER		JOULIA
MODEL		J3/DR-5P-630-W
HEATING CAPACITY	KW	2.9

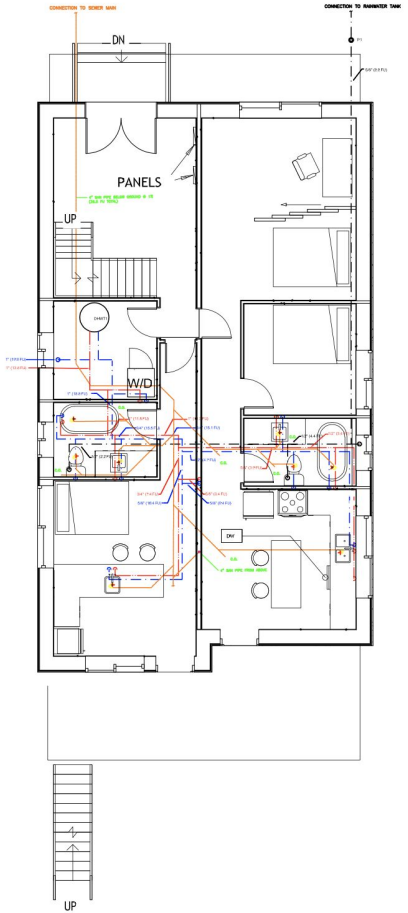
DOMESTIC HOT WATER TANKS		
Tag No.		DHWT1
MANUFACTURER		RHEEM
MODEL		XE80T10HS45U0
LOCATION		MECHANICAL ROOM
TYPE		ELECTRIC - HEAT PUMP HYBRID
SIZE (DIA x HEIGHT)	IN X IN	24.25 X 75
WEIGHT	LBS.	244
INPUT	W	4500
TANK VOLUME	GAL	80
RECOVERY	GPH	27
AMPERAGE	A	30
SUPPLY WATER TEMPERATURE	° F	145
HEATING COIL EWT	° F	50

PUMPS		
Tag No.		P1
LOCATION		OUTSIDE
SERVICE		RAINWATER
MANUFACTURER		GRUNDFOS
MODEL		SCALA2 3-45, 93013251
STYLE		BOOSTER PUMP
FLOWRATE	L/S	0.54
PRESSURE DROP	PSI	145.04
FLUID		RAINWATER
PUMP HOUSING		COMPOSITE
IMPELLER MATERIAL		COMPOSITE
WEIGHT	LBS.	26.5
POWER	W	550
SPEED	RPM	5200
VOLTAGE/PHASE		115/1/60

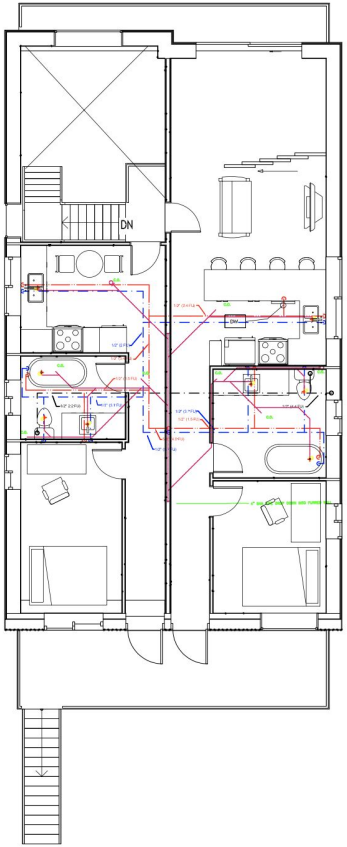
AIR SOURCE VRF HEAT PUMP					
LOCATION		MECHANICAL ROOM	IN SUITES	IN SUITES	MECHANICAL ROOM
MANUFACTURER		HISENSE	HISENSE	HISENSE	HISENSE
TAG		HP1	FC1	FC2	S/B1
MODEL		AVWT-72FFFH	AVS-07H3FTDD	AVS-09H3FTDD	HCHM-N08XB
DIMENSIONS (LXWXH)	IN	68-1/8X37-13/32X29-17/32	7-63/64X33-17/64X10-5/8	7-63/64X33-17/64X10-5/8	10-1/4X21-3/8X13-7/8
FLUID SOURCE		R410A	R410A	R410A	R410A
FLUID LOAD	LBS	13.2			
HEATING PERFORMANCE					
HEATING CAPACTIY	BTU/H	75,000	8,500	11,300	290,000
COP		4.15			
COOLING PERFORMANCE					
COOLING CAPACTIY	BTU/H	69,000	7,500	9,600	
EER		14.8			
IEER		31.3			
ELECTRICAL					
MCA	A	34.3	0.45	0.45	0.4
POWER	V/PH	230V/3PH	230V/1PH	230V/1PH	230V/1PH

VENTILATORS					
Tag No.		HRV1	HRV2	HRV3	EF1
LOCATION		WASHROOMS	ONE BEDROOM UNITS	ALL UNITS	KITCHENS
SERVICE		HEAT RECOVERY VENTILATION AND EXHAUST	HEAT RECOVERY VENTILATION	HEAT RECOVERY VENTILATION	KITCHEN RANGE HOOD
MANUFACTURER		LUNOS	LUNOS	LUNOS	AIR KING
MODEL		EGO BUILT-IN DEVICE	E2 BUILT-IN DEVICE	E2 BUILT-IN DEVICE	ESQZ2308
QUANTITY		4	2	8	4
DIMENSIONS	IN	6.3	6.3	6.3	12 X 30 X 6
POWER	W	4.9	2.8	3.3	18
THERMAL YIELD	%	81.4	90.6	90.6	-
CAPACITY	CFM	26.5	11.8	18.2	100-250
FILTER		MERV 13 INTERIOR COVER	MERV 13 INTERIOR COVER	MERV 13 INTERIOR COVER	GF-08 AND CF-08 FOR DUCTLESS

PLUMBING PLANS



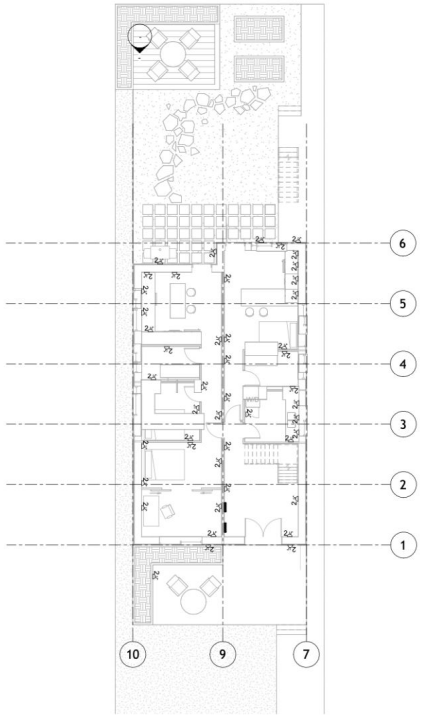
1 A1.01 Ground Floor
1 : 50



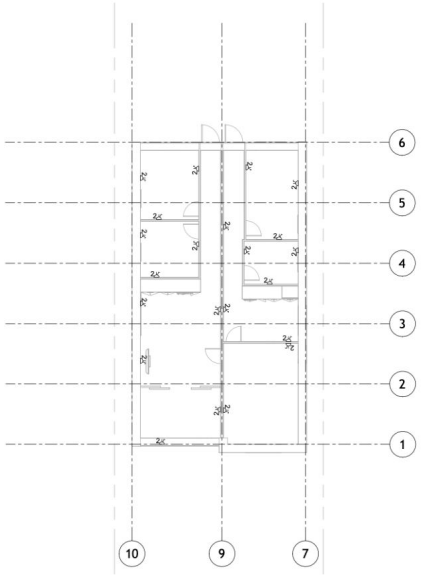
2 A1.01 Second Floor
1 : 50

Appendix

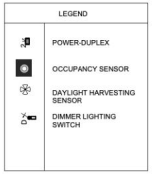
POWER PLANS



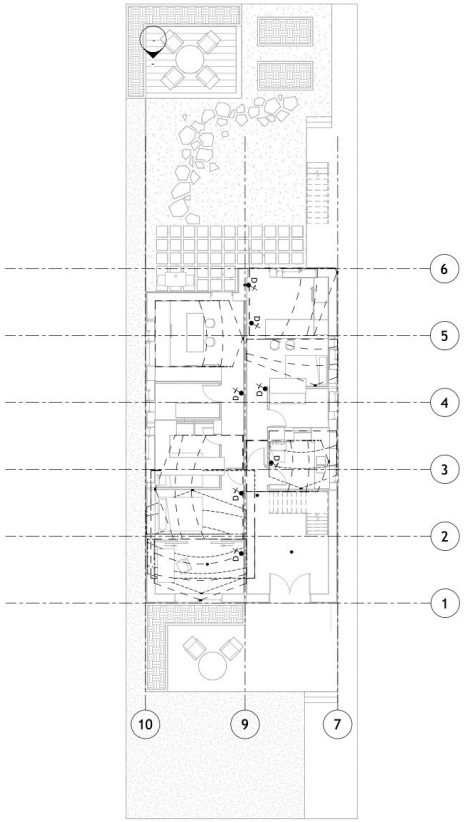
1 E101- Level 1 Power
1 : 100



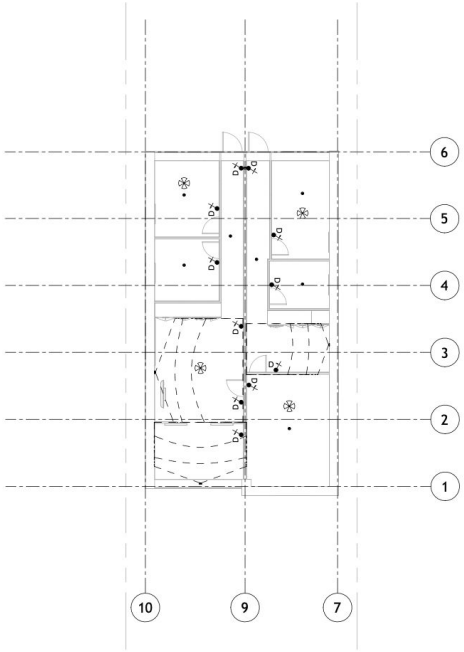
2 E101- Level 2 Power
1 : 100



LIGHTING PLANS A

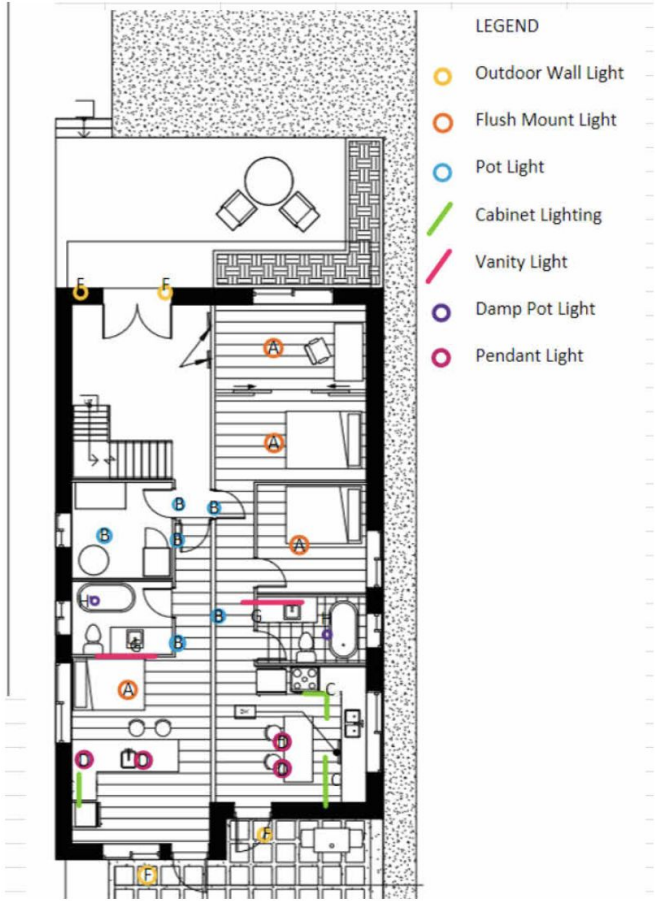


1 0 - Lighting
1 : 100



2 1 - Lighting
1 : 100

LIGHTING PLANS B



1 LEVEL 1 LIGHTING
1 : 10

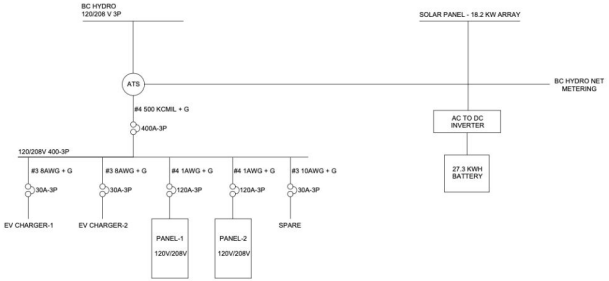
2 LEVEL 2 LIGHTING
1 : 10

ELECTRICAL SCHEDULES

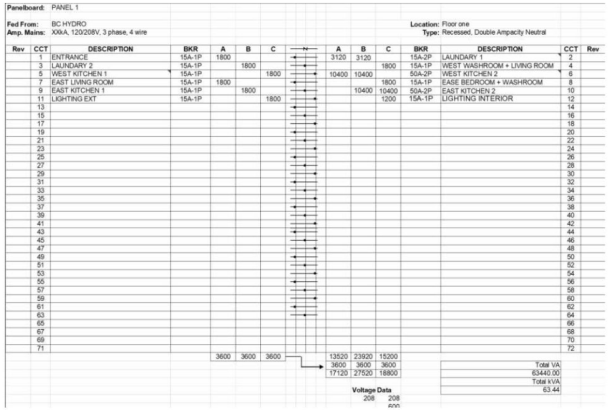
Lighting Schedule

TYPE	DESCRIPTION	LOCATION	FIXTURE	MANUFACTURER	SPECIFICATIONS	
A	14" Round Brushed Nickel Dimmable Flush Mount; Single Ring; 1750 Lumens ; Power: 25W ; 3 Color Switchable	Bedrooms	Flush Mount Light	LEDmyPlace	Bulb Type & Wattage	25W; LED
					Lumens	1750
					CRI	>80
					Color Temp	3000K
B	5 - 6" Round Surface Mount Disk Light; LED Recessed Lighting; 1200 Lumens; Power: 15W; Dimmable	Hallways, Boiler Room	Potlight	LEDmyPlace	Bulb Type & Wattage	15W; LED
					Lumens	1200
					CRI	>90
					Color Temp	3000K
C	Stream Under Cabinet LED Lights; 1350 Lumens; Power: 8W;	Kitchen	Strip Light	Artika	Bulb Type & Wattage	8W; LED
					Lumens	1350
					CRI	>80
					Color Temp	4000K
D	Towner 7" Wide LED Mini Pendant; LED bulb included; 800 Lumens; Power: 10W; Dimmable	Kitchen	Pendant Light	Generation Lighting	Bulb Type & Wattage	10W; LED
					Lumens	800
					CRI	90
					Color Temp	3000K
E	Oracle 5 Light Integrated LED Pendant; 1650 Lumens; Power: 22W; Dimmable	Front Lobby, Stariway	Chandelier	Artika	Bulb Type & Wattage	22W; LED
					Lumens	1650
					CRI	80
					Color Temp	3000K
F	LED Wall Light Fixture, Double Side, Light Bronze; 1920 Lumens Power: 24W	Front Entrance, Back Entrance	Wall Light	LEDmyPlace	Bulb Type & Wattage	24W; LED
					Lumens	1920
					CRI	
					Color Temp	3000K
G					Bulb Type & Wattage	24W; LED
					Lumens	2500
					CRI	90
	NUVO LED 36IN ENERGY STAR VANI	Bathroom Mirror	Vanity Light	Artika	Color Temp	3000K
H					Bulb Type & Wattage	35W; LED
					Lumens	650
					CRI	>80
	Slim 4-Inch LED Recessed Lighting wit	Bathroom	Potlight	LEDMyPlace	Color Temp	3000K

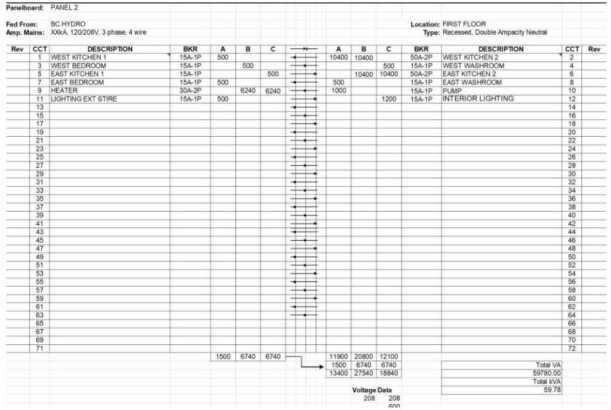
1 E103- Lighting Schedule
1 : 10



2 ELECTRICAL SINGLE LINE
1 : 10



3 PANEL 1 SCHEDULE
1 : 10



4 PANEL 2 SCHEDULE
1 : 10

ENERGY CALCULATIONS

Ekotrope Energy Consumption Results (Mbtu/yr)	**40.8**
On-Site Generation (Mbtu/yr)	**88.8**
BC Emissions Factor (tCO2e/Mbtu)	**0.03856**
GHGI (tCO2e/yr)	**-1.00256**

Climate	Bellingham, WA (equivalent climate, <50 miles south of site)
Utility	Electricity; Default Electric Provider
Conditioned Floor Area	2,403 sq. ft.
Infiltration Volume	20,509.6 cu. ft.
Year Built	2024
Housing Type	Multi-family detached
Floors above grade	2 (6 bedrooms)
Foundation Type	Slab
Slab Floor (75% of assembly calculations to account for thermal bridging and performance gap)	R-16 , 1162 sq. ft.
Above-grade walls (75% of assembly calculations to account for thermal bridging and performance gap)	R-32, Medium exterior colour
Windows	U-0.200 SHGC-0.350; Assuming interior shading: 0.85 (winter), 0.70 (summer); Adjacent shading: most (winter), most (summer)
Doors	U-0.770, Medium exterior colour
Roof (75% of assembly calculations to account for thermal bridging and performance gap)	R-40, 1,454 sq.ft. (with attic); Medium exterior colour, no radiant barrier, no clay or concrete roofing, presence of sub-tile ventilation
Mechanical Equipment	Heat Pump Hybrid DHWT; UEF 4.07; 80 Gal Storage Tank Air Source VRF; Heating capacity :75 kBtu/h, COP: 4.15; Cooling capacity: 69 kBtu/h, EER: 14.8; Indoor units with PSC fans.
DHW	Low-flow faucets & showers, insulated pipes; Farthest fixture from DHW: 40ft DWHR system
Infiltration	0.2 Natural ACH
Heat Recovery	Total Recovery: 81.4% for washrooms; 90.6% for other living spaces
Appliances	Standard Energy Star inputs, chosen appliance specifications
Photovoltaic Energy Systems	South-facing; 18.2 kWdc rated total capacity; 20 deg. Tile; 96% inverter efficiency

LCA CALCULATIONS

Section	Result category	Global warming kg CO2e	Biogenic carbon storage kg CO2e bio	Social cost of carbon
A1-A3	Construction Materials	**19,668.85**	**13,270.75**	**986.81**
A4	Transportation to site	**436.13**		**21.82**
A5	Construction/installation process	**2,250.77**		**113.05**
A5a	Site operations & site waste handling			
A5b	Site waste transportation			
A5c	Construction site - material wastage - materials	1,510.30		76.07
A5d	Construction site - material wastage - transport	43.86	0.00	2.19
A5e	Construction site - material wastage - waste	696.61	0.00	34.79
A5m-waste	Construction site - material use on site - waste			
B1	Use phase	**3,099.94**		**155.00**
B1-a	Refrigerant annual leakages	2,818.13		140.91
B1-b	Refrigerant loss, equipment replacement	187.88		9.39
B1-c	Refrigerant loss, equipment end of life	93.94		4.70
B1-d	Carbonisation			
B1-e	Vegetation withdrawal of carbon			
B3	Repair	0.00		0.00
B3a	Repair - materials	0.00		0.00
B3b	Repair - transport	0.00	0.00	0.00
B3c	Repair - waste	0.00	0.00	0.00
B4-B5	Material replacement and refurbishment	**4,216.62**		**210.70**
B4-B5a	Material replacement - materials	4,006.77		200.35
B4-B5b	Material replacement - transport	122.97	0.00	6.15
B4-B5c	Material replacement - waste	86.88	0.00	4.20
B6	Energy consumption	**5,051.26**		**252.56**
C1-C4	End of life	**7,138.85**		**356.45**
C1	Deconstruction/demolition			
C2	Waste transport	341.73		16.21
C3	Waste processing	6,767.59		338.75
C4	Waste disposal	29.52		1.48
D	External impacts (not included in totals)	**-65,593.07**		**-3,277.72**
D	Installed Materials - benefit (not included in totals)	**-21,842.70**	**0.00**	**-1,094.29**
A5-benefit	Construction site - material wastage - benefit (not included in totals)	**-1,453.29**	**0.00**	**-72.84**
B4-B5-benefit	Material replacement - benefit (not included in totals)	**-11.94**	**0.00**	**-0.61**
D2	Exported energy (not included in totals)	**-42,285.15**		**-2,109.97**

TOTAL	**41,862.42**

Appendix

PV PAYBACK PERIOD CALCULATIONS

Table 1: PV payback period calculations.

	No PV	PV panels
	Reference Home	Proposed Home
Array Size (kW)	0	18.2
Estimated cost $/kW	$ -	$ 2,100.00
Initial Cost	$ -	$ 38,220.00
On-Site Energy Production (kWh/y)		19,577.10
Electricity Demand kWh/yr	26,170.60	11,947.40
Electricity Rate $/kWh	0.095	0.095
Energy Savings		$ 2,486
Canada Greener Homes Grant		$ 5,000
PST 7% Tax exemption		$ 2,675
Maintenance costs (estimated at 2% of investment/yr)	$ -	-$ 764.40
Simple Paypack Period (yrs)		**17.7**

Surplus Energy for EV, expansion, or other uses (kWh/yr)	**7,629.70**

Appendix

PROJECT COST CALCULATIONS

Project Cost	
Total Cost	$465,949
Sources of Funding	
BC Housing SSIP	$40,000
CleanBC	$12,350
Mortgage	
Loan Amount	$413,599
Monthly Payment	$2,254

Appendix

PROJECT CASH FLOW CALCULATIONS

Income			
Unit Types	Sqft	Estimated Rent	Annual Income
Studio	291	$1,500	$18,000
1-Bedroom	390	$2,000	$24,000
2-Bedroom*	625	$2,400	$28,800
Total	1876	$5,900	$70,800
Expenses			
		Monthly Expense	Annual Expense
Mortgage (Retrofit)		$2,254	$27,054
Water and Sewer		$128	$1,530
Electricity		$124	$1,488
Maintenance		$542	$6,500
Property Tax		$463	$5,560
Total Expenses		$3,511	$42,132
Balance of Cash Flow		$2,389	$28,668

*While there is two 2-Bedroom units in the Vancouver Special 2.0, the second unit was kept out of the estimated income calculation.

RISKS

Identified Risk	Mitigation Strategy
Displacement of Occupants during Retrofit	Due to the replicable nature of the project, construction of Vancouver Special 2.0's can be simplified, reducing length of construction when adopted on a large scale.
Strain on Community Resources	City infrastructure already supports an increase in water, sewer and electricity consumption on single family lots. Choosing a site in close proximity to transit lines encourages their use, reducing the risk of reduced street parking availability.
Citizen-Developer Charging Market (Unaffordable) Rent	The Secondary Suite Incentive Program provides incentive for homeowners to charge below market rent (for one secondary suite) for the first 5 years. Beyond this time horizon, the project's contribution to housing availability across the city aims to increase supply and bring prices closer to an affordable level.