



CANADIAN HOME BUILDERS' ASSOCIATION
netzero home
LEADERSHIP SUMMIT

welcome

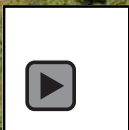
MEET OUR 2 DAY CO-HOSTS!



**Lynne J Strickland,
Director, Initiatives, Net
Zero Energy Housing, CHBA**



**Andy Oding,
Vice President, Director of
Building Science, Building
Knowledge Canada Inc.**



CANADIAN HOME BUILDERS' ASSOCIATION

netzero
home

LEADERSHIP **SUMMIT**



bigBLOCK
building communities at full throttle

LANDMARK HOMES
it's what's inside

ZIRNHILT
TIMBER FRAMES

avalon
MASTER BUILDER

SEAN.

Day 2 Agenda

MORNING AGENDA

8:30 Opening Day 2

8:45 Session 5: LEADING THE WAY. Meet 5 Builder Teams achieving Net Zero/Ready in Multi-Family projects.

10:15-10:45 Break upstairs in the HUB

10:45 Session 6: HOW LOW CAN YOU GO. Electrification on 100 amps?

12:00-1:00 LUNCH

Access the
full agenda
online here:



AFTERNOON AGENDA

1:00 Sponsors

1:15 Session 7: GOTTA KEEP 'EM SEPARATED. Compartmentalization for Multi-Family.

2:30-3:00 Break upstairs in the HUB

3:00 Session 8: ARE YOU READY FOR THIS? What's next for scaling a Net Zero future.

4:15 Closing

Access the
speaker info
online here:





NET ZERO READY MURBS

Affordable, Replicable and Marketable



The **OBJECTIVE** of this 5-year+ project was to **validate the use of panelized and modular construction and integrated mechanical system** technologies, design and construction practices on **Net Zero or Net Zero Ready MURBs** to optimize energy efficient performance, reduce costs, increase construction productivity and reduce construction schedules.

Project Lead

CHBA's Net Zero Home Labelling Program / Net Zero Housing team

Project Funding

Natural Resources Canada, Office of Energy Research and Development
(OERD)

Project Consultants

Andy Oding, Building Knowledge Canada
Derek Satnik & Seungyeon Hong, s2e
Wil Beardmore, Bluewater Energy
Dave Silburn, SHIFT Environmental Design and Consulting

Project Partners

BC Hydro, BC Housing, Enbridge

The expression of interest for this project went out in 2017.

From 2019, and still going, CHBA and our builder teams have persevered.

The **CHALLENGES** were unique.

COVID
COVID ECONOMY
AFFORDABILITY
PART 9 CONSTRAINTS
COVID
INDUSTRY CAPACITY
“POST” COVID ECONOMY
REGULATORY

Today we **CELEBRATE** that perseverance and the incredible movement forward that the research, application, and demonstration. The work that was accomplished through this initiative had impacts far beyond the individual participants.

Today we'll see how the willingness of our **NET ZERO BUILDERS**, combined with the dedicated collaboration with our **NET ZERO ENERGY ADVISORS**, consultants and our project partners has resonated for our own CHBA Net Zero Home Labelling Program to informing code for all Canadians.

Without the originating forethought of **NATURAL RESOURCES CANADA** to fund initiatives such as these, Canadians would miss out on the significant contributions that projects like these achieve.



Natural Resources
Canada

Ressources naturelles
Canada

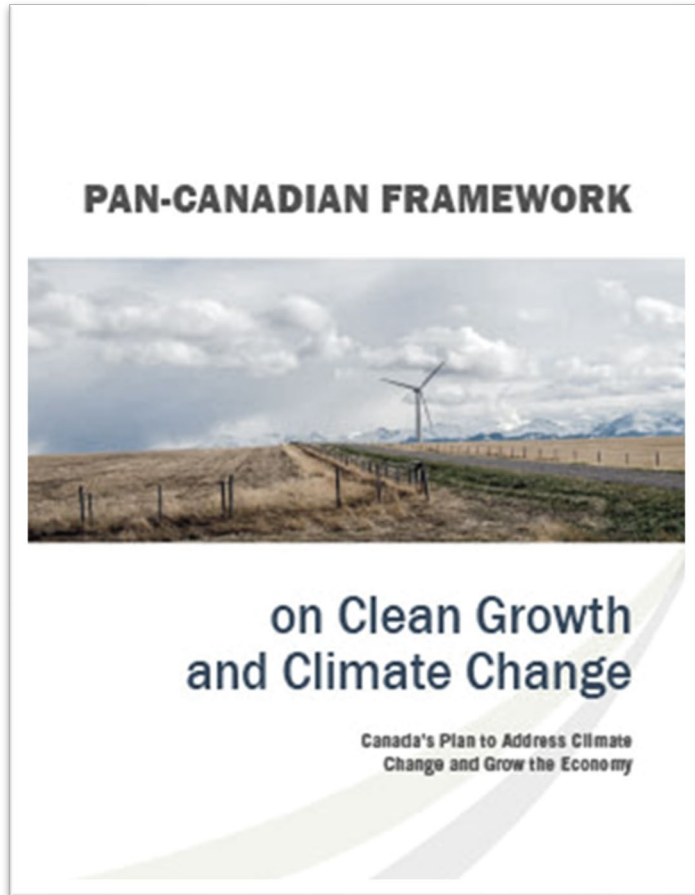
Housing Sector Innovation NRCan as a partner

Affordable, Replicable, and Marketable Net Zero Ready
MURBs – An Energy Efficient Building Funding Program
Demonstration Project

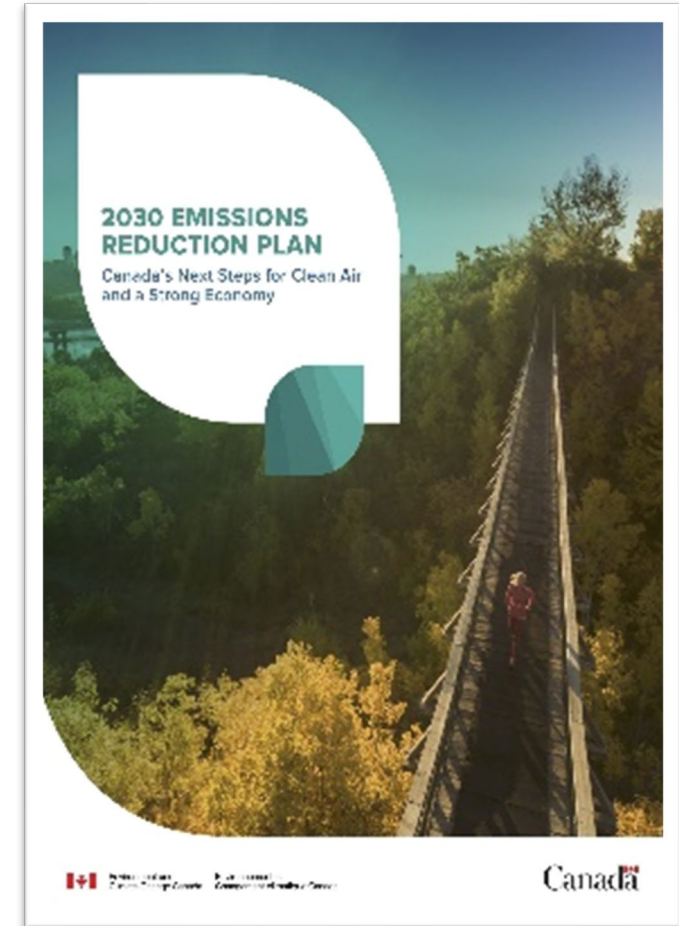
CHBA Net Zero Leadership Summit
June 12, 2024

Canada

Federal Mandate & Building Sector



- *Innovation is necessary for economic and climate objectives in 2030, 2035, and 2050*
- Half to two-thirds of emissions reductions needed to reach net-zero come from technologies that are **not yet ready for deployment**



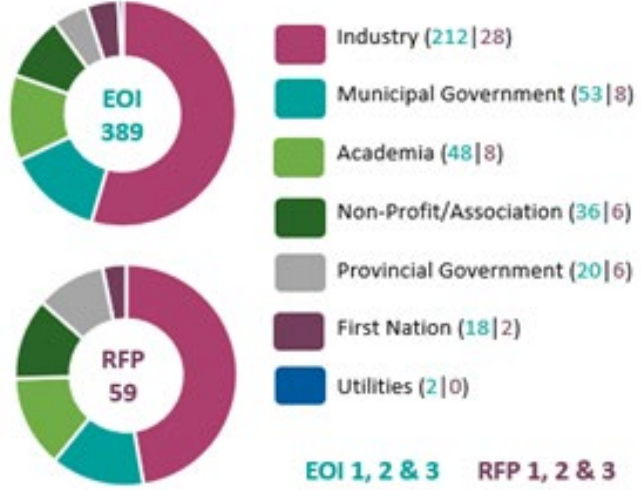
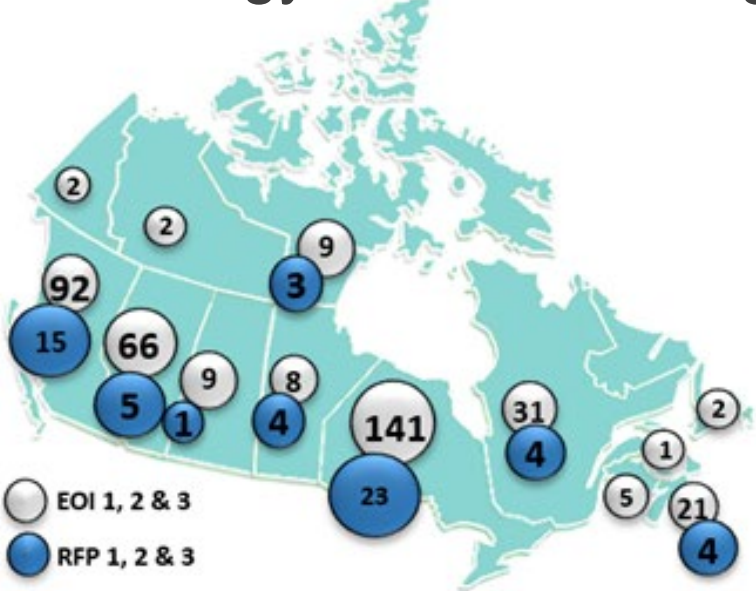
Energy Efficient Building Funding Program

- **\$182 million to increase energy efficiency and address climate change** by improving how our homes and buildings are designed, renovated, and constructed.
- Supporting **research, development and demonstration projects** that:
 - Accelerate the development and adoption of these codes and necessary technologies
 - Provide more cost-effective building solutions and validate their applications locally with real-world demonstrations
 - Build confidence with industry and provinces and territories to accelerate their adoption of revised building codes
 - Promote highly energy-efficient building design and construction practices



NRCCan is a Key Partner in Funding Innovation

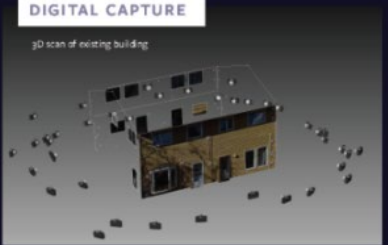
- Green Infrastructure Program Energy Efficient Buildings (2018-2026)
- Greener Neighbourhoods Pilot Program (Launched 2023)
- Energy Innovation Program



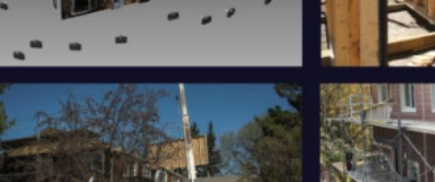
DEMONSTRATION			
	Project ID	Building type	Highlights
NEW CONSTRUCTION	GIBE-1093	Low-rise MURB	NZER; multi-site; prefabrication
	GIBE-1112	Mid-rise MURB	NZER; hybrid heating system
	GIBE-2204	Mid-rise MURB	NZER; comparative analysis
	GIBE-2215	Commercial/institutional,	NZER; multi-site; provincial program
	GIBE-2156	Low-rise MURB	Passive House; prefabrication
RETROFIT	GIBE-2160	Row houses	NZER; prefabrication;
	GIBE-2176	Mixed-use MURB	DER; student residence
	GIBE-2242	Row houses	NZER; <u>Energiesprong</u> ; prefabrication
	GIBE-L001	MURB	DER; student residence

Demonstration of Deep Energy Retrofits


Panelized Deep Energy Retrofits
THE PROCESS



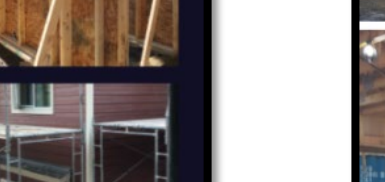
DIGITAL CAPTURE
3D scan of existing building



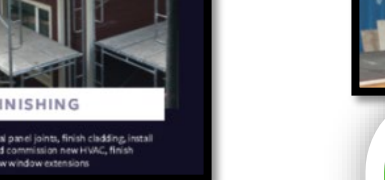
BUILD PANELS
Design panels with new windows and cladding in the factory



PREP BUILDING
Insulate foundation, install panel support wall, remove old windows and overhang




INSTALL
Install panels and blow cellulose insulation in cavity



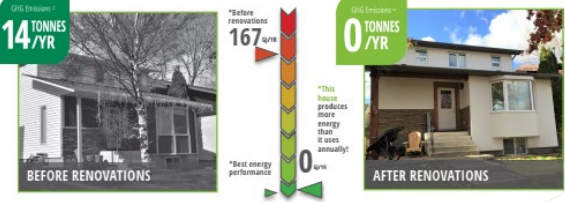
FINISHING
Seal panel joints, finish cladding, install and commission new HVAC, finish new window extensions



NET ZERO RENOVATION PILOT HOME
SOLARHOMES INC. 

Renovator: Peter Darlington, Solar Homes Inc. **Service Organization:** Enervision

Energy Advisor: Cooper Le, 4 Elements Integrated Design LTD. **Net Zero Pilot Home:** Calgary, AB (Climate Zone 6)



BEFORE RENOVATIONS: 14 TONNES CO₂e /YR, 167 kWh/yr

AFTER RENOVATIONS: 0 TONNES CO₂e /YR, 0 kWh/yr

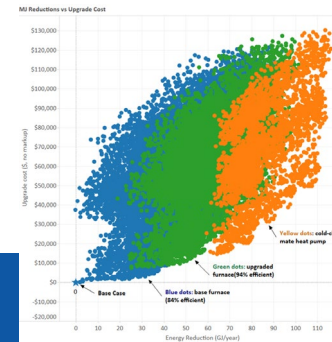
*Best energy performance

*This house produces more energy than it uses annually!



Accelerating Innovation and Technology Up-take

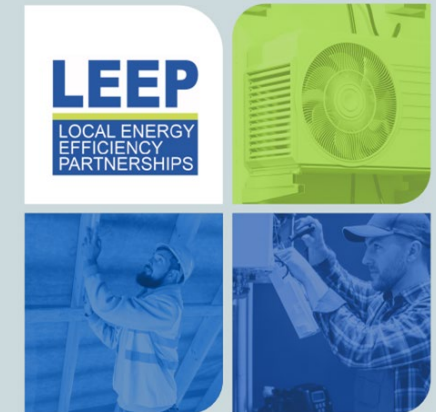
- Local Energy Efficiency Partnerships (LEEP) Initiative for Home Building Innovation
- Federal Tools (e.g. HTAP – CBAT – MC2)
- External Partners Tools
 - Building Envelope Thermal Bridging (BETB) Guide Expansion
 - Net Zero Navigator Platform



LEEP Workshops, Tools and Guides

LEEP events, tools, resources and guides provide time saving ways for industry to learn about the information they need so they can move confidently towards building higher performance, resilient homes faster and more affordably.

NEW !



LEEP Resource Guide

New High-Performance Construction Demos



Breakthrough Energy Solutions Canada



NET ZERO
MULTI-UNIT RESIDENTIAL BUILDING

netzero home
The ultimate in comfort and efficiency

netzero ready home
The ultimate in comfort and efficiency

BUILDER Avalon Master Builder

Energy Advisor Cooper Le, 4 Elements Integrated Design

Location Calgary, AB (Climate zone 7a)

15,700 SQFT

Code-Built MURB: 661 GJ/yr

This MURB: 436 GJ/yr

This MURB with installed Remodels: 207 GJ/yr

Modelled Energy Use Breakdown

- Water Heating 20%
- Ventilation 2%
- Space Cooling 4%
- Space Heating 18%
- Occupant Load 56%

Energy modeling results are from HOT2000 Version 11.1.0. The total modeled operational GHG emissions are 54.3 tonnes CO₂e/yr.

NET ZERO
MULTI-UNIT RESIDENTIAL BUILDING

netzero ready home
The ultimate in comfort and efficiency

1st Net Zero Ready Labelled MURB in the West

BUILDER Big Block Construction

Energy Advisor Darcy Bzdel, Sun Ridge Residential Inc.

Location Saskatoon, SK (Climate zone 7a)

11,600 SQFT

Code-Built MURB: 577 GJ/yr

This MURB: 292 GJ/yr

Modelled Energy Use Breakdown

- Ventilation 1%
- Occupant Load 63%
- Water Heating 9%
- Space Cooling 4%
- Space Heating 23%

Energy modeling results are from HOT2000 Version 11.1.0. The total modeled operational GHG emissions are 54.3 tonnes CO₂e/yr.

BUILDING ENCLOSURE	MECHANICALS	OTHER FEATURES
Windows: Berdick Windows, Triple Glazed Walls: R-36 2x10 Wall, Staggered 2x6 & 2x4 Studs Ceiling: R-80 Blow-in Foundation: ICF Crawlspace Airtightness: Lower Units: R-28 2x8 wall Envelope: 52% better than NRC can ref	Fuel Source: Dual Fuel (electricity + natural gas) Heating & Cooling: Detson Chinook Furnace Upper Units: also include ASHP Water Heating: Rheem Heat Pump Ventilation: Upper Units: Lifebreath HRV	Units: 12 total, (6 first floor, 6 second floor) 2 and 3 bedroom units Prefabrication Approach: Full modular construction Labelling Approach: Whole Building Common Area: N/A Building Ownership: Rental Building

bigBLOCK construction

"There are three groups associated with any build: the people living there, the owners of the project, and the community at large. Each of these groups benefits from building better developments. If we're ever truly going to make a change in our community and advance both our building practices and processes, we need to ensure that we are working together in collaboration and sharing that knowledge across the entire community to ensure that we are building better communities and building better projects. If you're going to build a multifamily project and you're considering sustainability, modular has to be on the table. It absolutely can be a scalable, affordable, Net Zero, repeatable project done anywhere in Canada."

- Alex Miller, CEO

For more information on the Net Zero MURB Initiative visit www.cbba.ca/NetZeroMURB

BETTER BUILDINGS BC
THE NET-ZERO ENERGY-READY CHALLENGE



Net Zero Energy Ready Challenge

The Canada Green Buildings Strategy

- The **official Strategy** engagement and development
 - A **discussion paper** was shared
 - 3 Rounds of **formal engagement**
 - **Regional Tables** – with Ministerial participation



[The Canada Green Buildings Strategy - discussion paper \(PDF, 2.24 KB\)](#)

10 key takeaways with one on RD&D:

“RD&D + Scale: Continue development of low carbon technologies and practices + scale technologies as needed”



[What We Heard report \(PDF, 747 KB\)](#)



[Summary of Engagement with Indigenous Partners \(PDF, 675 KB\)](#)



Latest NRCan Initiatives



Codes Acceleration Fund

Support for PTs and other players to accelerate adoption + compliance with highest tiers of national model energy codes



Deep Retrofit Accelerators initiative

Support for organizations – concierge services, aggregators – that *facilitate* retrofit project pre-development and implementation



Greener Neighbourhoods Pilot Program

Support for organizations that facilitate retrofit project pre-development and implementation AND demonstration projects in clusters of community housing units



Natural Resources
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Canada



Canada
**Greener
Homes**
Initiative

Federal Budget 2024



The **Canada Green Buildings Strategy** seeks to address the twin challenges of energy affordability and climate change.

- \$800 million to launch a **new Canada Greener Homes Affordability Program**
- \$30 million to continue developing a **national approach to home energy labelling**
- \$73.5 million to **renew and modernize existing energy efficiency programs**
 - Offer tools to building owners like the ISO 50001 Energy Management Systems Standard and ENERGY STAR® Portfolio Manager.



Natural Resources
Canada

Ressources naturelles
Canada

Canada

Thank You

Philippe St-Jean

Office of Energy Research & Development
Natural Resources Canada
580 Booth Street, 14th Floor
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613-697-7307

Philippe.st-jean@NRCan-RNcan.gc.ca



© His Majesty the King in Right of Canada, as represented by the Minister of Natural Resources, 2023

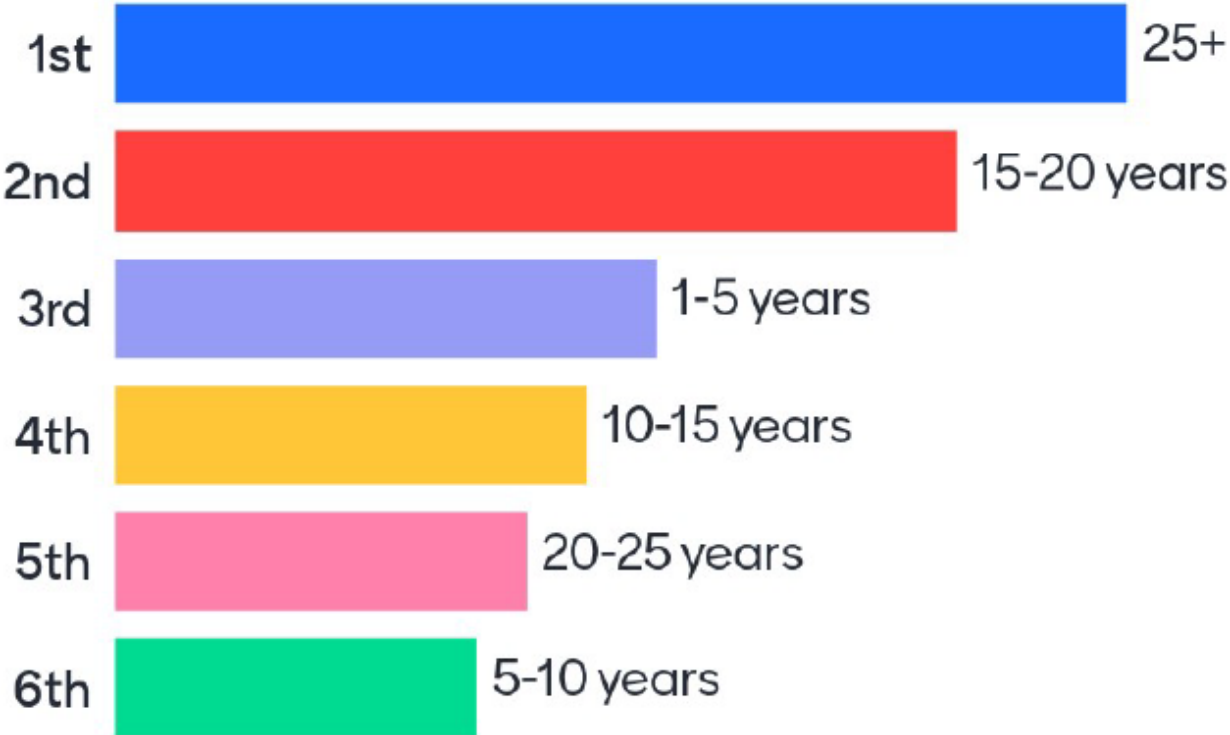


Natural Resources
Canada

Ressources naturelles
Canada

Canada

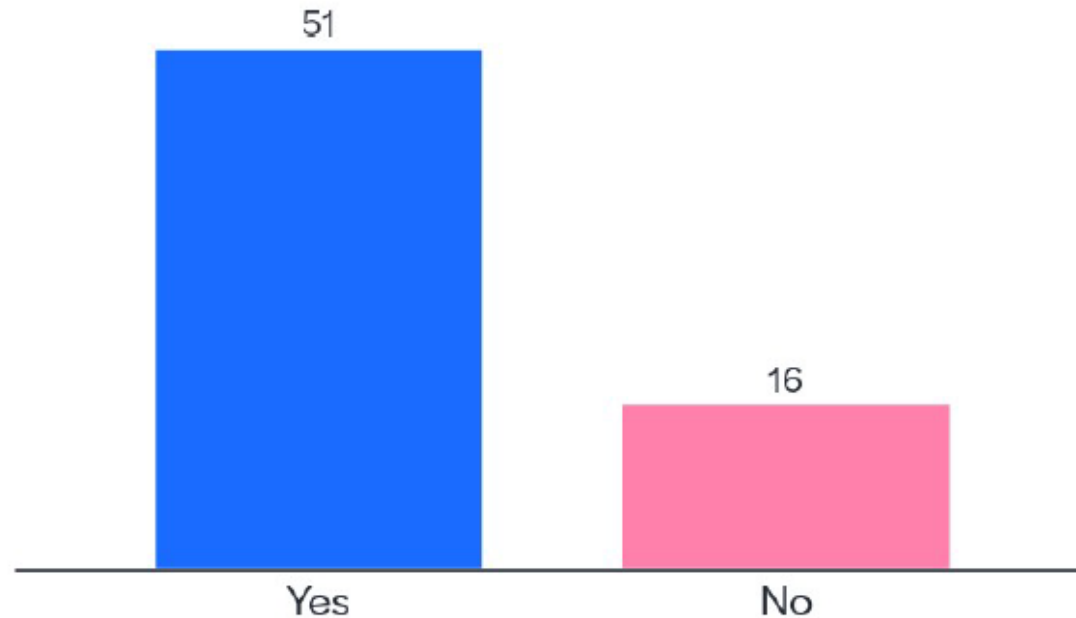
How long have you been in the construction industry



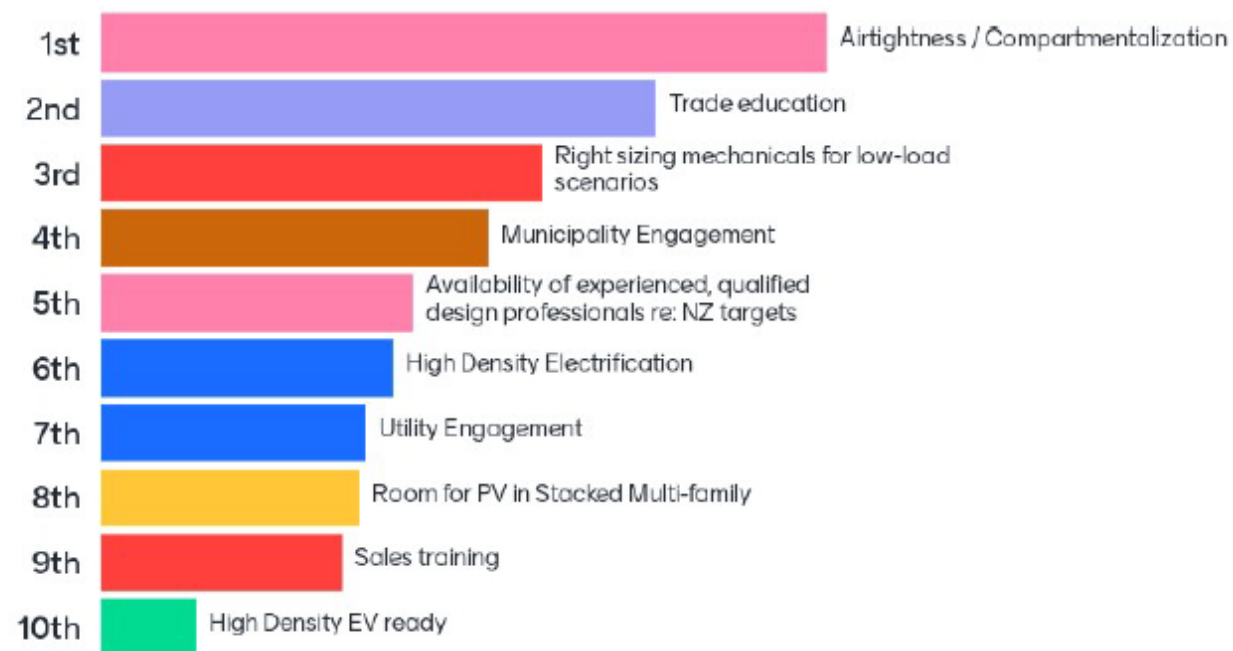
How long have you been involved in Net Zero?



Have you been involved in Multi-Family construction? MURB (Multi Unit Residential Building)?



What are your top issues facing scaling high performance / NZ MURBs? (Select all that apply)





NET ZERO READY MURBS

Affordable, Replicable and Marketable



*WE ARE (MULTI) FAMILY
We've got all the BUILDERS
and "E"(A's)*





NET ZERO READY MURBS

Affordable, Replicable and Marketable



Builders & Energy Advisors Leading the Way: Net Zero Multi-Family Construction



Ben Miller
Big Block Construction



Neil Hawkins
Avalon Master Builder



Haitao Yu
Landmark Group



Sam Zirnhelt
Zirnhelt Timber Frames



Sean Mason
SEAN.ca



Darcy Bzdel
Sun Ridge Residential



Cooper Le
4 Elements



Gilles Lesage
Total Home Solutions



Angela Bustamante
Building Knowledge Canada



Ben Miller
Vice President,
Operations
Big Block Construction



Darcy Bzdel
CEO, Energy Advisor
Sun Ridge Residential



NET ZERO READY MURBS

Affordable, Replicable and Marketable



PROJECT LOCATION: Saskatoon, SK

NET ZERO ENERGY ADVISOR: Darcy Bzdel, Sunridge Group

NET ZERO READY UNITS: 12

CLIMATE ZONE: 7a

STATUS: Occupied 2020

OWNERSHIP TYPE: Rent



NET ZERO
MULTI-UNIT RESIDENTIAL BUILDING



PROFILE #1



BUILDER Big Block Construction

Energy Advisor Darcy Bzdel, Sun Ridge Residential Inc.

Location Saskatoon, SK (Climate zone 7a)

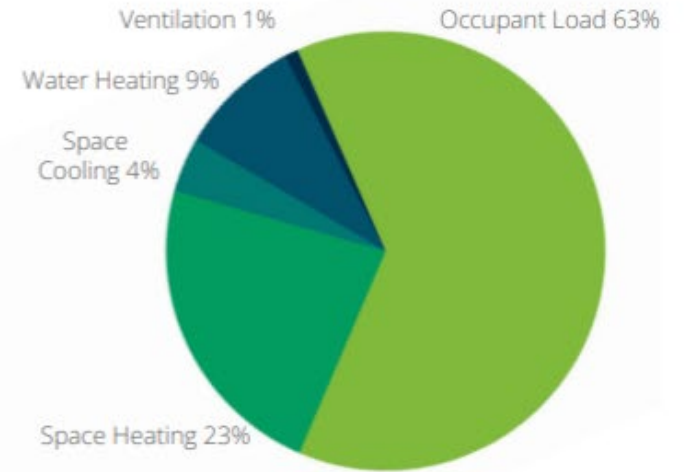


Code-Built MURB:
577 GJ/yr

This MURB:
292 GJ/yr



Modelled Energy Use Breakdown



Energy modelling results are from HOT2000 Version 11.10. The total modelled operational GHG emissions are 54.3 tonnes/CO₂e/yr.

BUILDING ENCLOSURE

Windows:

Berdick Windows, Triple Glazed

Walls:

R-36 2x10 Wall,
Staggered 2x6 & 2x4 Studs

Ceiling:

R-80 Blown-in

Foundation:

ICF Crawlspace
Lower Units: R-28 2x8 wall

Airtightness:

0.47 ACH@50

Envelope:

52% better than NRCan ref

MECHANICALS

Fuel Source:

Dual Fuel
(electricity + natural gas)

Heating & Cooling:

Dettson Chinook Furnace
Upper Units: also include ASHP

Water Heating:

Rheem Heat Pump

Ventilation:

Upper Units: Lifebreath HRV

OTHER FEATURES

Units:

12 total, (6 first floor, 6 second floor)
2 and 3 bedroom units

Prefabrication Approach:

Full modular construction

Labelling Approach:

Whole Building

Common Area:

N/A

Building Ownership:

Rental Building



For more information on the Net Zero MURBs initiative visit www.chba.ca/NZMURBS



NZE(r) MURBs & Volumetric Modular Construction are a natural fit!*

* if and only if . . .

Lesson 1: Modular is Manufacturing

Design, Build, Ship, Crane & Integrate with Modular in Mind

Integrated design involves education & alignment with:

- internal team
 - suppliers
 - trades
 - client
 - tenants
- about...*
- ✓ design
 - ✓ purchase
 - ✓ install
 - ✓ set up
 - ✓ interface



Design / Preconstruction (Aug 2019 – April 2020)

Lesson 2. NZE(r) Homes + Volumetric Modular = Cost Effective

- **Factory / On Site Assembly:** detailed analysis led to minor tweaks to a proven product with big results
- **Minimal Upgrade Cost :** standard spec upgrade to NZR increased build cost by ~3% for this 12-plex



Construction & Commission (May - Dec 2020)

Takeaways: Lessons Learned

1. Increase Cooling for Upstairs Comfort

Insufficient A/C to cool upstairs rooms in multi-level units, esp. south-facing windows with extra solar gain.

Current solution:
Exterior sun shades install.

2. Improve Insulation for Mechanical Exhaust

Minimal mechanical system run-time leads to exhaust freeze ups in extreme cold or wind.

Current solution:
Insulated with Tees & 90s.

3. Increase Feasibility for Solar Install

Rental cases makes this more difficult; unable to do sub-metering for solar generation & separate arrays required for separate panels.

Current solution:
Panels rarely installed.

What's Next? Replicating Multi-Family with Modular

Streamline Approvals for Modular MURBs

Municipal policies do not recognize factory certification for volumetric modular MURBS.

Proposed solution:

Municipalities interested in accelerating housing starts can recognize factory certification for modular MURBs.

FOLLOW ALONG:
www.bigblockconstruction.ca

WORK WITH US:
hello@bigblockconstruction.ca



Neil Hawkins
Development Manager,
Avalon Master Builder



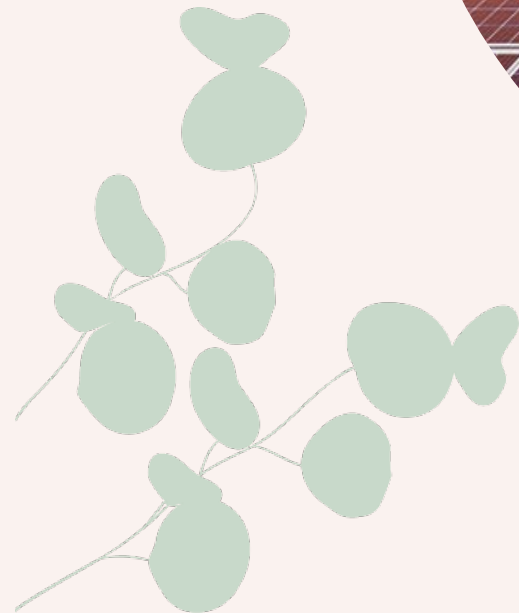
Cooper Le
Energy Advisor
4 Elements Integrated
Design

2024 Net Zero Leadership Summit

CHBA Net Zero Home MURB Pilot - Avalon

Avalon Master Builder

June 2024





NET ZERO READY MURBS

Affordable, Replicable and Marketable



PROJECT LOCATION: Calgary, AB

NET ZERO ENERGY ADVISOR: Cooper Le, 4 Elements

NET ZERO UNITS: 8

NET ZERO READY UNITS: 8

CLIMATE ZONE: 7a

STATUS: Occupied 2021

OWNERSHIP TYPE: Condo





PROFILE #2

NET ZERO

MULTI-UNIT RESIDENTIAL BUILDING



BUILDER Avalon Master Builder

Energy Advisor Cooper Le, 4 Elements Integrated Design

Location Calgary, AB (Climate zone 7a)



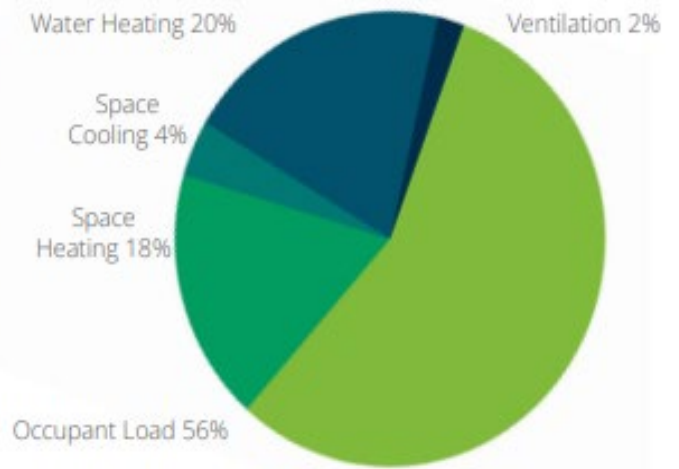
Code-Built MURB:
661 GJ/yr

This MURB:
436 GJ/yr

This MURB with Installed Renewables:
207 GJ/yr



Modelled Energy Use Breakdown



Energy modelling results are from HOT2000 Version 11.11. The total modelled operational GHG emissions are 46.4 tonnes/CO₂e/yr.

BUILDING ENCLOSURE

Windows:

Triple glazed, Low e

Walls:

R22 batt + R7.5 rigid foam

Ceiling:

R60 blown-in

Foundation:

R20 batt + R10 rigid foam

R15 foam under slab

Airtightness:

1.4 ACH@50 (on avg.)

Envelope:

64% better than NRCan ref (on avg.)

MECHANICALS

Fuel Source:

All-electric

Heating & Cooling:

NZ Upper units: ccASHP +

electric resistance backup

NZr Lower units: Electric baseboards

Water Heating:

NZ Upper units: Heat pump

NZr Lower units: Electric tank

Ventilation:

Lifebreath HRVs

OTHER FEATURES

Units:

16 total

1, 2, and 3 bdrm units

Prefabrication Approach:

Off-site prefab framing

Labelling Approach:

Individual unit

Common Area:

N/A

Building Ownership:

Freehold



"Avalon's Net Zero homes in Zen Sequel have proven that the cost of financing net zero and the utility savings associated with a net zero home have finally come to intersect. Zen Sequel homeowners live in healthier, more comfortable, and quieter homes for the same monthly cost, averaged over the year, as non net zero homes."

- Chris Williams , Vice President

For more information on the Net Zero MURBs initiative visit www.chba.ca/NZMURBS

CHBA NZE MURB Pilot

Avalon ZEN Sequel



3.6 acre, 8 building, 124 unit stacked townhome community

One building of 16 units is designated as Net Zero

Condominium Units will be for purchase

Upper 3 level, 1380sqft and 1740sqft – Downsizers and Families

Lower 1 level, 520sqft and 670sqft – Singles and Investors



zenbyavalon.com/zen-sequel

338 Seton Close SE

Calgary, Alberta, Canada

Avalon NZE MURB Pilot

Energy Reducing Economics

	GJ Savings	\$\$ per GJ
Space Heating - Air Source Heat Pump	14.0	\$482.86
Heat Pump Hot Water Tank	6.0	\$367.35
Drain Water Heat Recovery	1.1	\$654.55
Aerobarrier - from 2.5 ACH to 0.7 ACH	4.5	\$555.56
Windows - Double to Triple	4.3	\$373.61
Solar Panels (PV)	28.2	\$404.49

Lessons Learned

Different and Affordable

- Learned to Think/Talk/Do Different – Is it an HRV or a **Fresh Air System**? Is it R-Values, GJs and window panes or **Comfort, Health, and Durability**. Do different is the biggest challenge.
- Learned the Increase in Mortgage Equalled the Utility Savings Averaged Over the Year



Lessons Learned

Electrification

- What is the real peak load?
 - 4.7 or 8.3 or 12.5 KVA of transformer capacity/unit
- Should Net Zero Envelope Resiliency change load calcs?
- Do utilities know where we are headed as a Building Industry?

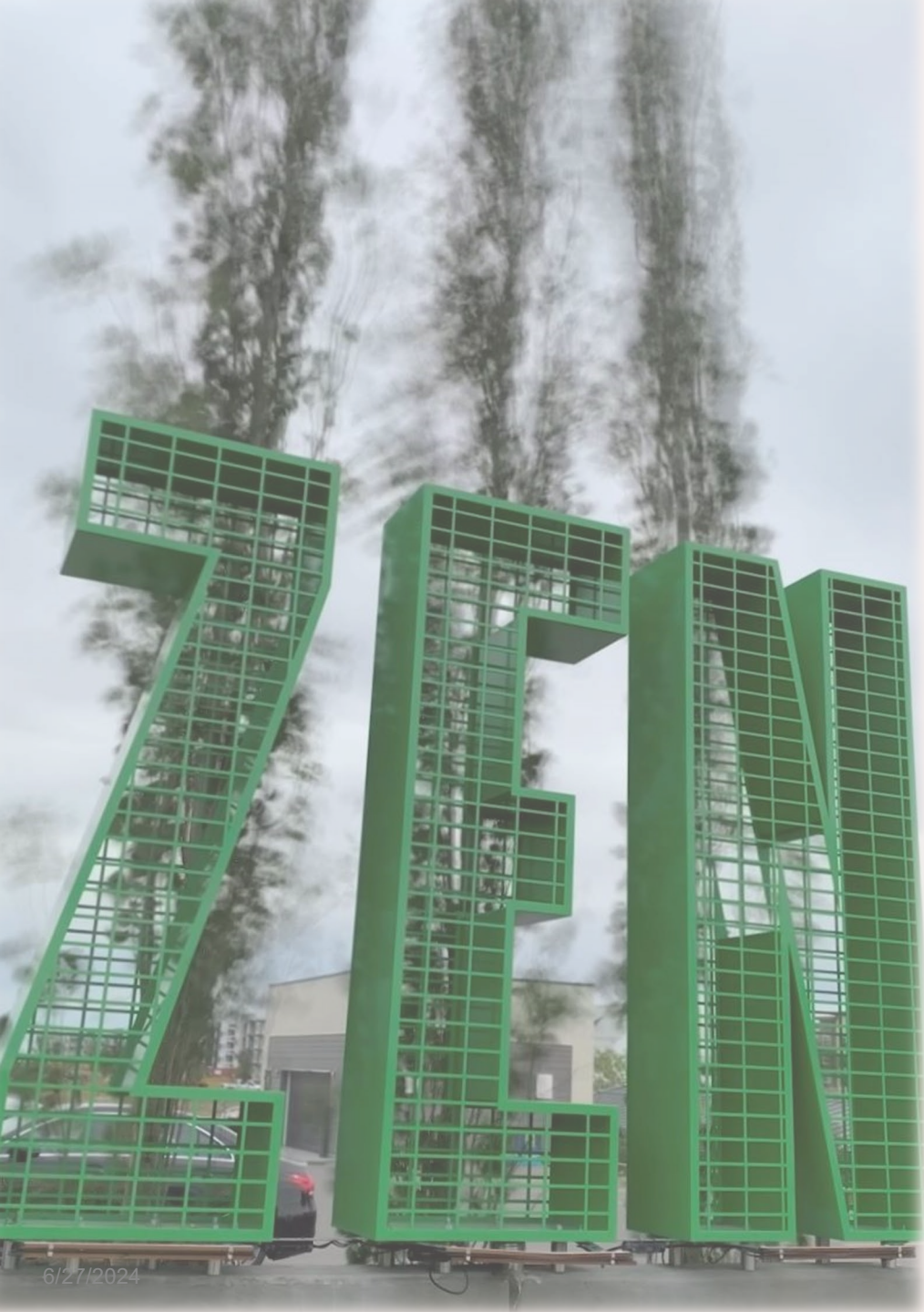


Avalon NZE MURB Pilot

Stats...

Unit	Unit Type	Label	Energy Use (GJ/a)					NBC 2020 (AE) Tier		Carbon Emissions (tCO ₂ e)			
			Envelope Improvement	Consumption	Generation	Reference	Consumption %LTR	Total %LTR	Overall Improvement	Heat Loss Reduction	Proposed	Reference	Carbon %LTR
20557	Lower	NZE Ready	65.3%	28	0	35	30%	20%	4	5	4.5	5.5	19%
20561	Lower	NZE Ready	82.5%	25	0	28	11%	11%	3	4	4.0	4.4	10%
20563	Lower	NZE Ready	82.5%	25	0	28	11%	11%	3	4	4.0	4.4	10%
20569	Lower	NZE Ready	82.8%	25	0	28	11%	11%	3	4	4.0	4.4	10%
20571	Upper	NZE Ready	82.8%	25	0	28	11%	11%	3	4	4.0	4.4	10%
20577	Lower	NZE Ready	82.8%	25	0	28	11%	11%	3	4	4.0	4.4	10%
20579	Lower	NZE Ready	82.5%	25	0	28	11%	11%	3	4	4.0	4.4	10%
20583	Upper	NZE Ready	57.5%	33	0	35	17%	10%	4	4	4.4	5.5	15%
20555	Upper	NZE	33.2%	35	40	65	46%	108%	4	4	-0.8	10.4	107%
20559	Upper	NZE	55.6%	28	31	49	47%	110%	3	5	-0.9	7.8	112%
20565	Upper	NZE	55.6%	28	31	49	43%	106%	4	4	-0.6	7.8	107%
20567	Upper	NZE	55.6%	26	31	49	47%	110%	5	4	-0.7	7.8	109%
20573	Upper	NZE	57.7%	27	31	49	45%	109%	4	4	-0.6	7.8	108%
20575	Upper	NZE	55.6%	27	31	49	45%	108%	4	4	-0.6	7.8	108%
20581	Upper	NZE	55.6%	27	31	49	45%	108%	4	4	-0.6	7.8	108%
20585	Upper	NZE	36.8%	31	44	64	52%	120%	5	4	-1.9	10.4	118%

- Lower Units Envelope Improvement Ranged from 37% to 83% - Lower Units averaged 77% and Upper 50%
- Only Uppers had dedicated solar, and we totaled 434 GJs of consumption and 270 GJs of Generation (62% of Load Covered)
- 13% better than reference on the lowers (Alternative Path), 46% better on uppers (110% with solar)
- All units met tier 4 performance of the upcoming NBC 2020 code, with a couple units meeting tier 5
- Emissions savings 12% on lowers and 110% on uppers



Thank you!

Chris Williams
cwilliams@avalonhomes.com

avalonhomes.com





it's what's inside



Haitao Yu
R&D Director
Landmark Group



Cooper Le
Energy Advisor
4 Elements Integrated
Design



NET ZERO READY MURBS

Affordable, Replicable and Marketable



PROJECT LOCATION: Edmonton, AB

NET ZERO ENERGY ADVISOR: Cooper Le, 4 Elements

NET ZERO UNITS: 11

CLIMATE ZONE: 7a

STATUS: Occupied 2022

OWNERSHIP TYPE: Rental





it's what's inside



PROFILE #3

NET ZERO

MULTI-UNIT RESIDENTIAL BUILDING



BUILDER Landmark Homes

Energy Advisor Cooper Le, 4 Elements Integrated Design

Location Edmonton, AB (Climate Zone, 7a)

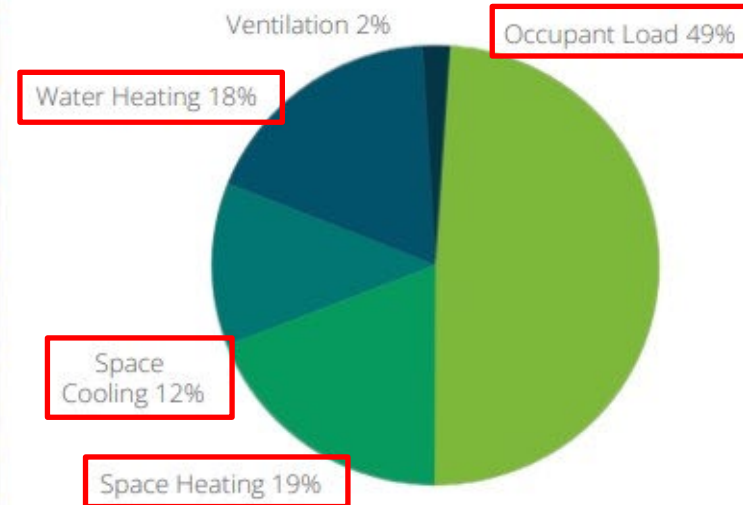


Code-Built
MURB:
776 GJ/yr

This MURB:
486 GJ/yr



Modelled Energy Use Breakdown



Energy Modelling results are from HOT2000 Version 11.11. The Modelled Energy Use Breakdown above is based on an average of the 11 units.

Percentage Improvement:

Townhomes: 46% | Stack units: 47%

www.chba.ca/NZMURB



BUILDING ENCLOSURE

Windows:

Triple Glazed, Low-e argon

Walls:

2x6 24"O.C, R22 batt + R5 XPS

Ceiling:

R-60 Blown Cellulose

Foundation:

Slab-on-grade, R-8 under slab

Airtightness:

1.90-2.84 ACH@50

Envelope:

58% better than NRCan ref (avg.)



it's what's inside

MECHANICALS

Fuel Source:

Middle units: Dual-fuel

End units: All-electric

Heating & Cooling:

Middle units: Hi-Velocity ASHP

+ Fan Coil

End units: Tosot Ductless Minisplit

+ Baseboards

Water Heating:

Middle units: Navien Tankless

Water Heater

End units: AO Smith Heat Pump

Water Heater

Ventilation:

Fantech HRVs

OTHER FEATURES

Units:

11 total

7 – three storey middle units

4 – stacked end units

Prefabrication Approach:

Off-site panelized

Labelling Approach:

Middle units (7): row homes

Stacked end units (4): single unit MURBs

Common Area:

N/A

Building Ownership:

Rental Units

For more information on the Net Zero MURBs initiative visit www.chba.ca/NZMURBS

BUILDING ENCLOSURE

Windows:

Triple Glazed, Low-e argon

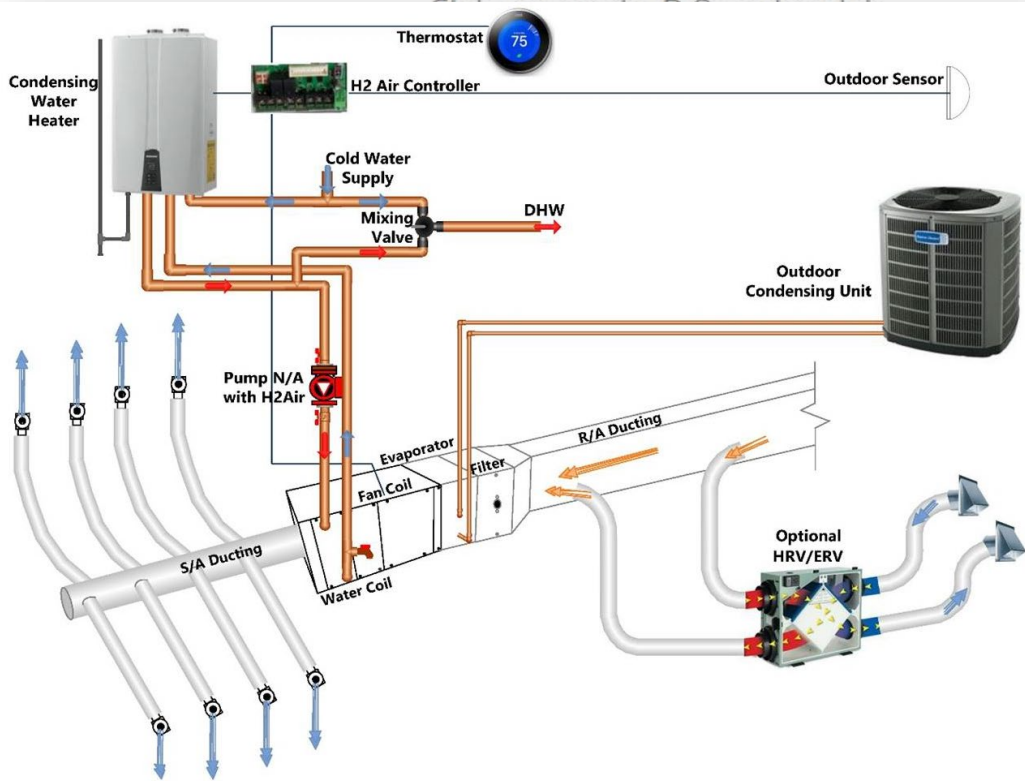
Walls:

2x6 24"O.C, R22 batt + R5 XPS

Ceiling:

R-60 Blown Cellulose

Foundation:



MECHANICALS

Fuel Source:

Middle units: Dual-fuel

End units: All-electric

Heating & Cooling:

Middle units: Hi-Velocity ASHP
+ Fan Coil

End units: Tosot Ductless Minisplit
+ Baseboards

Water Heating:

Middle units: Navien Tankless
Water Heater

End units: AO Smith Heat Pump
Water Heater

Ventilation:

Fantech HRVs

OTHER FEATURES

Units:

11 total

7 – three storey middle units

4 – stacked end units

Prefabrication Approach:

Off-site panelized

Labelling Approach:

Middle units (7): row homes

Stacked end units (4): single unit MURBs

Common Area:

N/A

Building Ownership:

Rental Units

Net Zero Ready vs. Net Zero:

- Utility costs of homeowners
- Grid carbon intensity

For the Net Zero MURBs initiative visit www.chba.ca/NZMURBS

BUILDING ENCLOSURE

Windows:

Triple Glazed, Low-e argon

Walls:

2x6 24"O.C, R22 batt + R5 XPS

Ceiling:

R-60 Blown Cellulose

Foundation:

Slab-on-grade, R-8 under slab

Airtightness:

1.90-2.84 ACH@50

Envelope:

58% better than NRCan ref (avg.)



it's what's inside

MECHANICALS

Fuel Source:

Middle units: Dual-fuel

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Water Heating:

Middle units: Navien Tankless

Water Heater

End units: AO Smith Heat Pump

Water Heater

Ventilation:

Fantech HRVs

OTHER FEATURES

Units:

11 total

7 – three storey middle units

4 – stacked end units

Prefabrication Approach:

Off-site panelized

Labelling Approach:

Middle units (7): row homes

Stacked end units (4): single unit MURBs

Common Area:

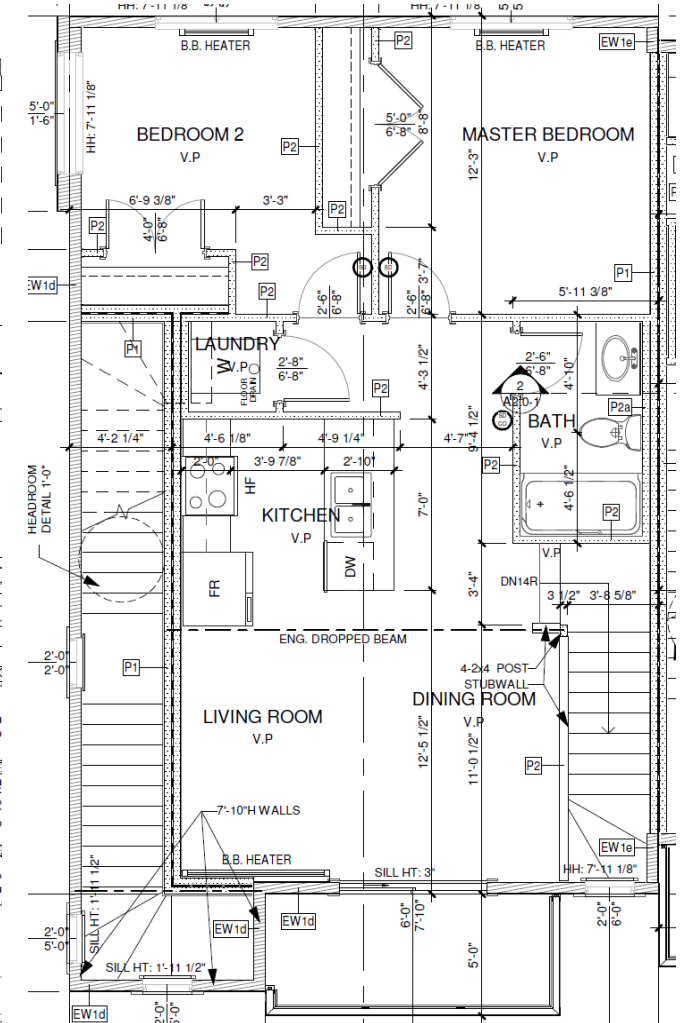
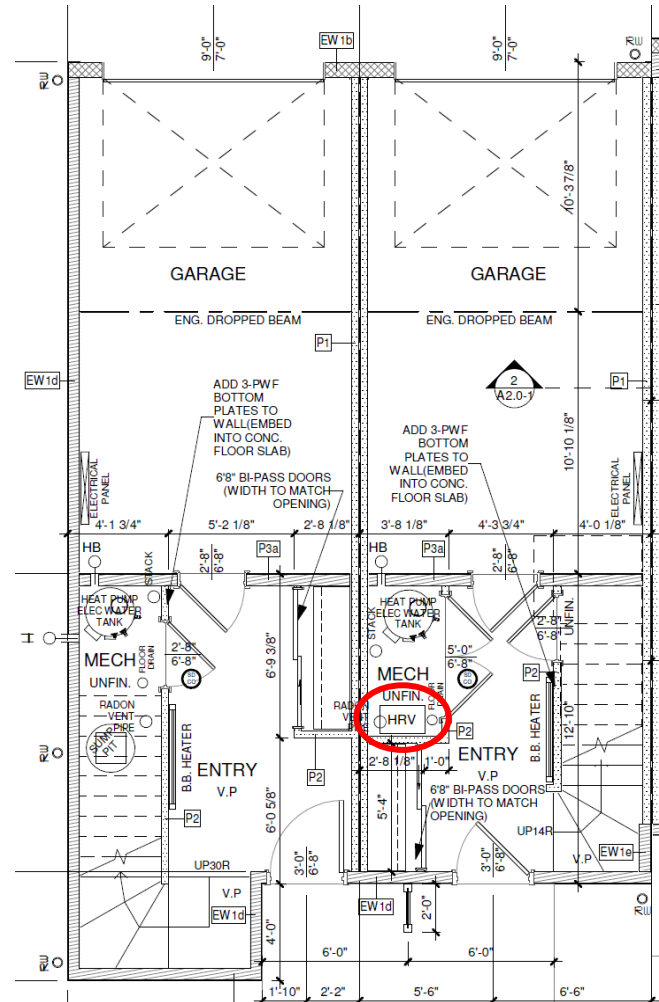
N/A

Building Ownership:

Rental Units

For more information on the Net Zero MURBs initiative visit www.chba.ca/NZMURBS

Lessons Learned: Air-tightness of Lower Stacked Units





Sam Zirnhelt
President
Zirnhelt Timber Frames



Gilles Lesage
Energy Advisor
Total Home Solutions



NET ZERO READY MURBS

Affordable, Replicable and Marketable



PROJECT LOCATION: Williams Lake First Nation, BC

NET ZERO ENERGY ADVISOR: Gilles Lesage, Total Home Solutions Inc.

NET ZERO UNITS: 2

CLIMATE ZONE: 6

STATUS: Occupied Fall 2022

OWNERSHIP TYPE: Rental





BUILDER Zirnhelt Timber Frames

Energy Advisor Gilles Lesage, Total Home Solutions

Location Williams Lake, BC (climate zone 6)

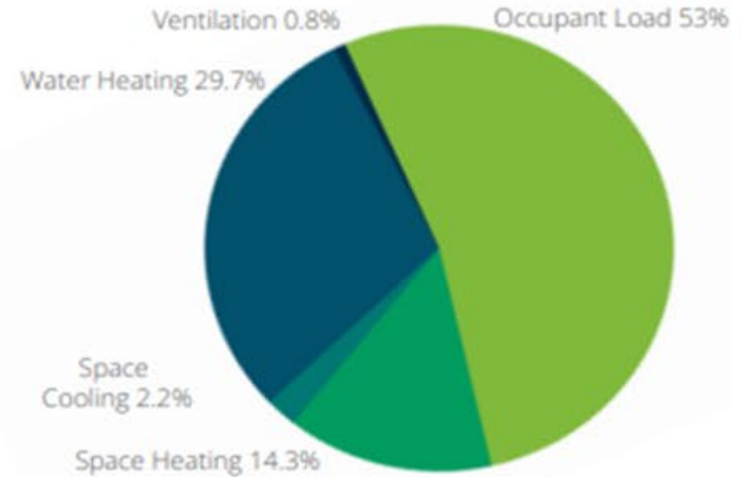


Code-Built
MURB:
79 GJ/yr

This MURB:
57 GJ/yr



Modelled Energy Use Breakdown



Energy modelling results are from HOT2000 Version 11.11.
The total modelled operational GHG emissions are 0.0 tonnes/CO₂e/yr.

BUILDING ENCLOSURE

Windows:

Triple dual, Low e 270

Walls:

2x8" R28 blown in + R8 Roxul exterior insulation

Ceiling:

R46 Expanded Polystyrene (EPS)

Foundation:

R28 ICF

R12.5 foam under slab

Airtightness:

0.57 ACH@50

Envelope:

66% better than NRCan ref

MECHANICALS

Fuel Source:

All-Electric

Heating & Cooling:

Mini-split ASHP,
Electric baseboards

Water Heating:

Electric Tank

Ventilation:

VanEE HRV

OTHER FEATURES

Units:

2 total, (1 bedroom units)

Prefabrication Approach:

Off-site panelized

Labelling Approach:

Whole Building

Common Area:

N/A

Building Ownership:

Rental Building



For more information on the Net Zero MURBs initiative visit www.chba.ca/NZMURBS



DESIGN, IDP & CONSTRUCTION

- Consistency with detailing from design phase
- Integrated Design Process (IDP) is key
- Trade coordination must be planned
- As GC and manufacturer, training, trades education and experience key to making these projects work
- Custom design with MURBs





ENERGY ADVISOR & MECHANICAL DESIGN



- Efficiency achieved comparable to Tier 4/5 of New NBC 2020 9.36
- OPERATIONAL Carbon reduction vs code Annual reduction per unit.
- **Challenge:** Mechanical design capacity for smaller scale solutions
- **Challenge:** Climate proofing from -50 to +50 Celsius
- **Challenge:** Back up heat – overcoming installation assumptions on primary heat versus augmenting & dual source for remote locations (e.g. power outages)
- **Challenge:** Grid tie vs. diesel generated grids & unmonitored grids



CLIENT RELATIONSHIPS & EXPERIENCES



- Future proofing a home requires more thought, material selection, detailing & quality control = some (short to mid-term) cost added
- Educating owners - value proposition
- **Challenge:** For owners and builders alike - inconsistency around incentives - both utilities and governments
- **Challenge:** Messaging from industry, government & utilities needs consistency; dealing with impacts of rumours around the grid capacity with EVs
- **Challenge:** Lack of consistent information with rapid evolution of technologies (e.g. heat pumps, solar, storage, load mgt) and building code changes

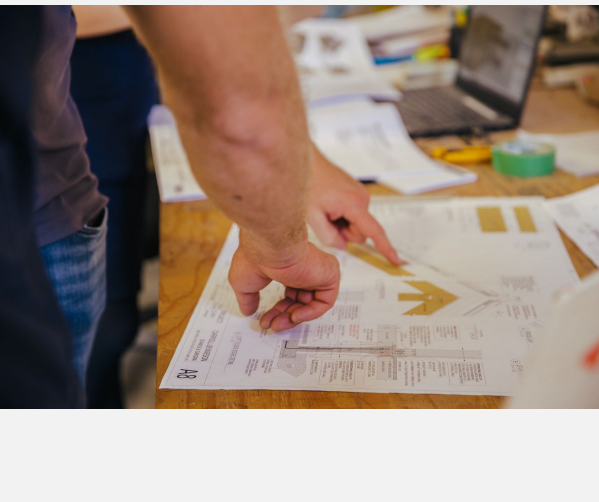
NET ZERO PROJECT – WHAT’S NEXT



- Improvements (comfort, durability, energy efficiency/carbon reduction (embodied & operational), beauty/care) in our built environment (building a great home) today requires a team - EA’s, designers, PMs, trades, building authorities, engineers & clients
- In our case the best results are always design-build
- We are particularly passionate about increasing the standard of housing in First Nation communities (partnerships, capacity building, education, support incl. warranty & labels)

NET ZERO PROJECT – EA's Perspective

- Extreme temperatures = closer monitoring/house as a system
- Base Loads and their effect on MURB units
- Lack of Reduced Operating Conditions for MURBs
- Variances of Solar modeling:
 - HOT2000 projections
 - Solar design projections
 - Actual real-world generation



SEAN.



Sean Mason
Founder
SEAN.ca



**Angela
Bustamente**
Energy Advisor
Building Knowledge



NET ZERO READY MURBS

Affordable, Replicable and Marketable



SEAN.

PROJECT LOCATION: Barrie, ON

NET ZERO ENERGY ADVISOR: Angela Bustamante, Building Knowledge Canada

NET ZERO READY UNITS: 8+2

CLIMATE ZONE: 6

STATUS: Occupancy 2024

OWNERSHIP TYPE: Condo



SEAN.

NET ZERO

MULTI-UNIT RESIDENTIAL BUILDING



PROFILE #5



BUILDER SEAN.

Energy Advisor Angela Bustamante, Building Knowledge Canada

Location Barrie, ON (Climate Zone 6)

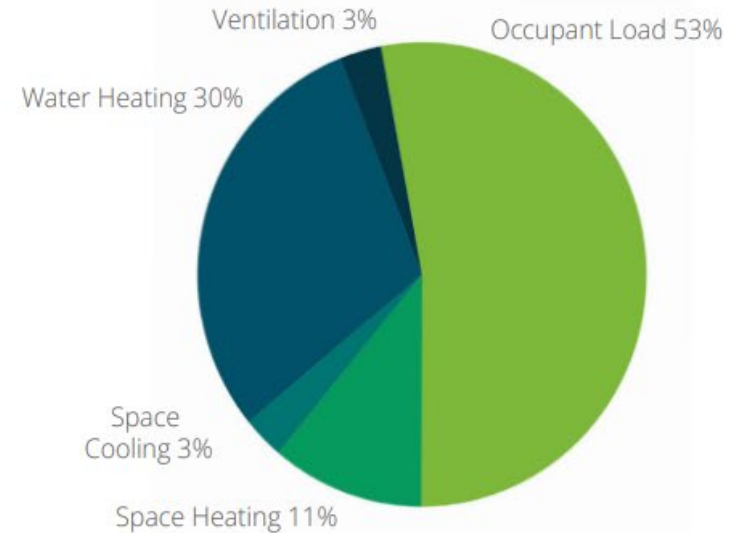


Code-Built
MURB:
468 GJ/yr

This MURB:
253 GJ/yr



Modelled Energy Use Breakdown



Energy modelling results are from HOT2000 version 11.11. The total modelled operational GHG emissions are 4.06 tonnes/CO2e/yr.



BUILDING ENCLOSURE

Windows:

Inline Fibreglass, U 1.25, SHGC 0.31

Walls:

R22 batt + R5 XPS
(24"O.C on 2nd and 3rd floors)

Ceiling:

R-60 & R-31

Foundation:

Slab on grade, R-10 under slab

Airtightness:

2.0 ACH@50

Envelope:

46% better than NRCan ref (avg.)

MECHANICALS

Fuel Source:

All-Electric

Heating & Cooling:

WaterFurnace Versatec
500 Geothermal

Water Heating:

Electric Tank

Ventilation:

VanEE ERVs, 75% SRE

OTHER FEATURES

Units:

10 units

Prefabrication Approach:

Off-site wall panelization

Labelling Approach:

Single Unit

Common Area:

N/A

Building Ownership:

Condo Ownership

SEAN.

SEAN.

RAIN WATER @ 339 VETERANS

Barrie, ON



- Participated in the Enbridge Savings By Design which conducted a charette that led us through the process to push the boundaries of our conventional design targeting a minimum 20% reduction in energy use vs. OBC.
- The townhomes will be dual labelled Net Zero Ready (Performance Path) and Energy Star for New Homes (Prescriptive Path).
- In partnership with Enbridge Sustain, geothermal bore holes have been dug up to 360 feet deep to supply the towns with HVAC and hot water.
- Exterior insulation R-5, advanced window systems, low-flow water fixtures, smart home technology to control energy usage, 4.5 m concrete roads with 1.5 m of permeable paving on the downstream side, storm water infiltration chambers within the park, and EV chargers, modern xeriscaping, soak away pits and rain gardens
- OVE framing at 24" o.c. on second and third floors as appropriate, panelized off-site in our yard, including Tyvek and outboard insulation installed off-site
- Air tightness best practices to surpass the CHBA NZR target of 2.0ach/0.15 NLR , with the inclusion of Aerobarrier technology.

SEAN.

Lessons Learned:

- Struggles getting to completion
- Municipal regulations – including changes regarding secondary suites, fire separation
- Working with utilities, no gas then all electric and then all geo.
- Scaling
- Geothermal
- Transfer of information from towns to condos
- Transfer of information to next projects in Bracebridge and Brampton

SEAN.

121 WOODWARD

Lessons Learned at Rainwater became product at 121 Woodward in Bracebridge.

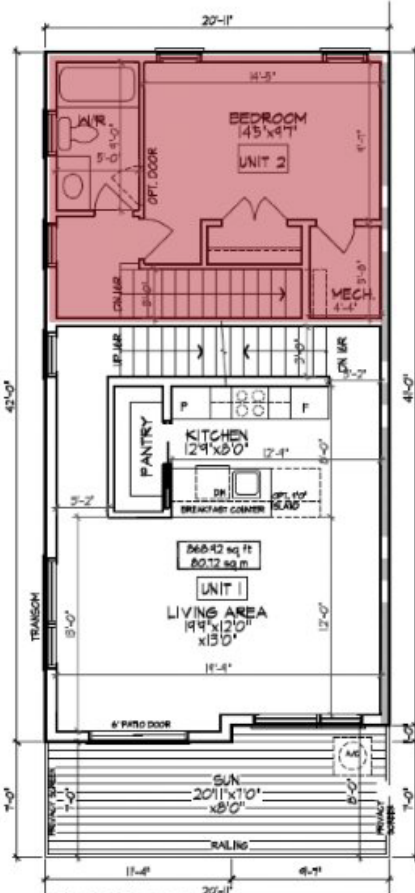
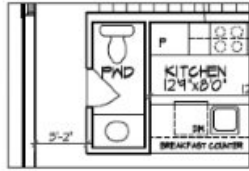


SEAN.

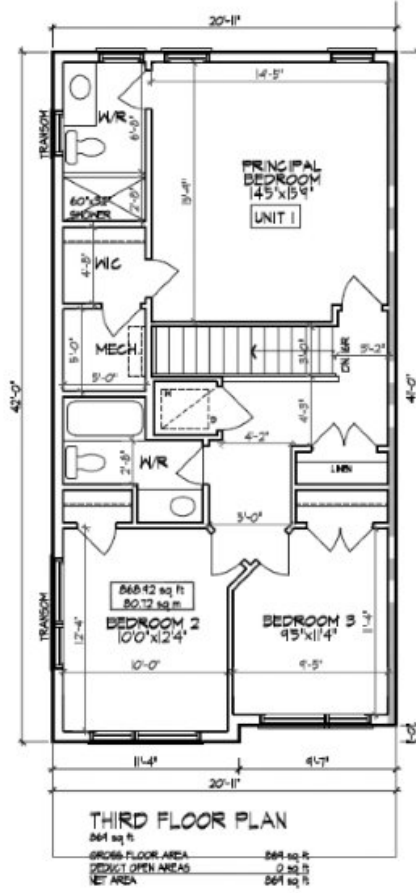
121 WOOD WARD



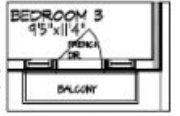
GROUND FLOOR PLAN
284 sq ft
COVERAGE W/O PORCH: 255 sq ft
COVERAGE W/ PORCH: 1025 sq ft



MAIN FLOOR PLAN
264 sq ft
GROSS FLOOR AREA: 264 sq ft
DEDUCT OPEN AREAS: 0 sq ft
NET AREA: 264 sq ft



THIRD FLOOR PLAN
264 sq ft
GROSS FLOOR AREA: 264 sq ft
DEDUCT OPEN AREAS: 0 sq ft
NET AREA: 264 sq ft



BEDROOM 3: 9 5" x 11 4"

BALCONY

PART, THIRD FLR. PLAN W/ EGRESS BALCONY (IF REQ'D BY GRADE)



SEAN HOMES - 222076
BRACEBRIDGE, ONTARIO

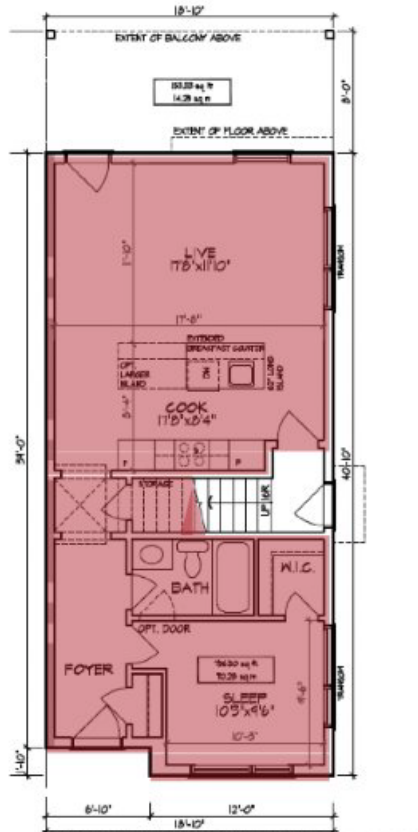
8966 Woodbine Ave, Markham, ON L3R 0J7 | T 905.737.5133 | F 905.737.7326 | MAR 2024 | V0

UNIT C
AREA - 2607 SF
2220/1001_UNIT C

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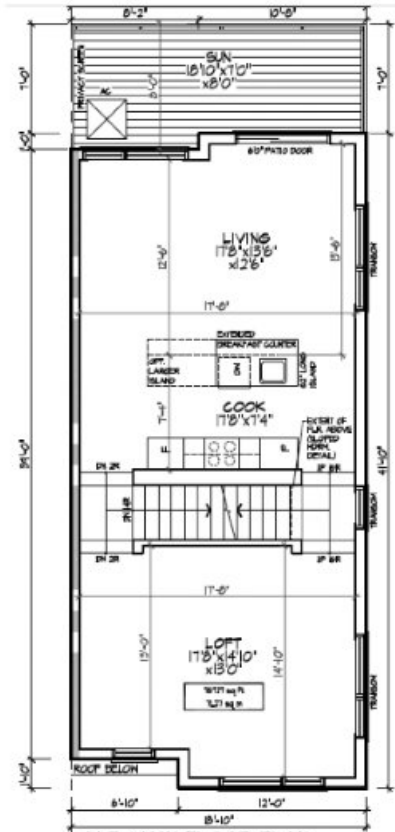
SEAN.

121 WOODWARD



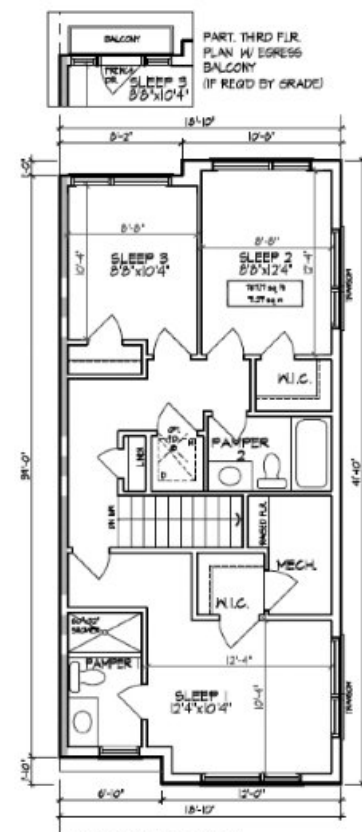
OPT. GROUND FLOOR PLAN (N LIB) OF GARAGE W/ SEPERATE SECONDARY SUITE
751 sq ft


netzero readyhome
 The ultimate in comfort and efficiency
SEAN HOMES - 222076
 BRACEBRIDGE, ONTARIO
 5966 Woodbine Ave., Markham, ON L3R 0J7 | T 905.737.911
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ALT. MAIN FLOOR PLAN W/ LOFT
751 sq ft

GROSS FLOOR AREA	751 sq ft
DECKGT. OPEN AREAS	0 sq ft
NET AREA	751 sq ft

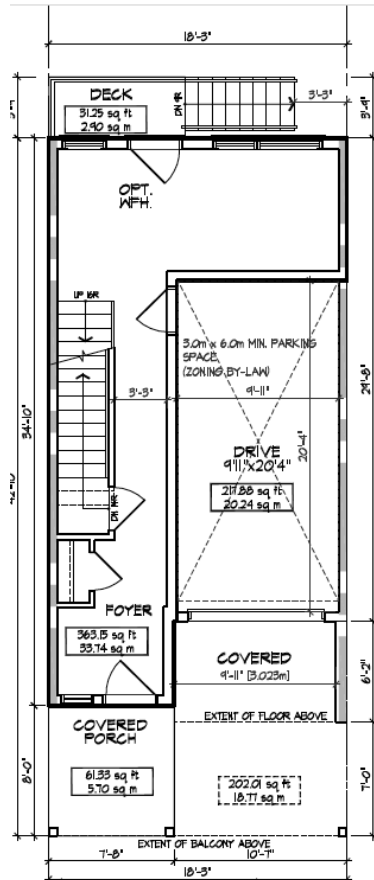


THIRD FLOOR PLAN
751 sq ft

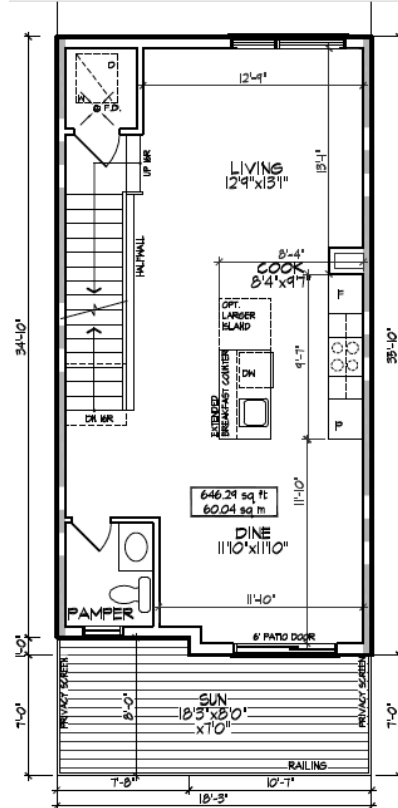
GROSS FLOOR AREA	751 sq ft
DECKGT. OPEN AREAS	0 sq ft
NET AREA	751 sq ft

SEAN.

121 WOODWARD

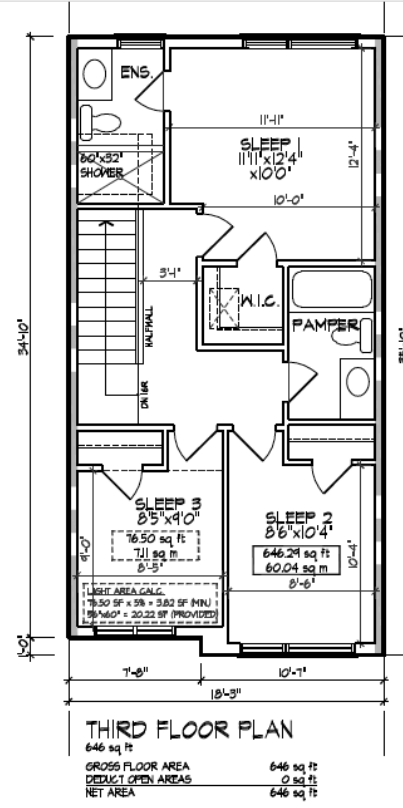


(W.O.B./L.O.D. COND)
GROUND FLOOR PLAN
360 sq ft
COVERAGE W/O PORCH 391 sq ft
COVERAGE W/ PORCH 815 sq ft



MAIN FLOOR PLAN
W/ OPT. PAMPER
646 sq ft

GROSS FLOOR AREA 646 sq ft
DEDUCT OPEN AREAS 0 sq ft
NET AREA 646 sq ft



PART. THIRD FLR.
PLAN W/ EGRESS
BALCONY
(IF REQ'D BY GRADE)



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TH-9 (FRONT-LOAD)

1655 SF
222076DT1902

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Project Projection:

42% Total Annual Energy Consumption over the Reference House

46% Better than Reference Envelope Improvement

NBC 2020 analysis Hot2000 v11.12:

62% Overall Energy Performance

28% Envelope Performance Improvement

Tiers are not assessed for MURBs ~ estimate Tier 4/5

Energy Advisor Perspective:

- Continual changes in drawings so Hot2000 needs updating which means targets change. Number of units change.
- Looking at the envelope. Original plan 2x4 struggles with the Truss manufacturer. What can we do or not. Do we hit the target for envelope?
- Geothermal – tends to have another party involved with HVAC that are used to geo modelling or Part 3 outputs in terms of air changes, etc.
- Building Code potential changes through the project that could impact the EEDS/BOPS.
- The impact of the window selection.
- How everything ties in every time there is a change. E.g. windows SHGC could impact geo design.
- In the background always thinking about how the homes will actually be labelled technically as Energy Star, EnerGuide through NRCan's protocols and then CHBA's as well.