Decarb Lunch Series

zebx

BC Hydro Power smart

CITY OF VANCOUVER

Legendary Airtightness

The Most Airtight Homes of the NearZero Program

Wed Apr 27, 2022,
from 12- 1pm PDT
Free Webinar I zebx.org

BCIT BRITISH COLUMBIA INSTITUTE OF TECHNOLOGY

mood provided by: spring gang
song: Go Blind (Instrumental Version)

RESOURCES

SORTING:

Categories:

- [ ] Articles
- [ ] Case Studies
- [ ] Past Events
- [x] Podcasts
- [ ] Reports
- [ ] Videos & Slides

Series:

- [ ] Decarb Lunch
- [ ] Deep Emissions Retrofit Dialogue
- [ ] NZER Challenge Playbook Series
- [ ] NZER Challenge Winners Series
- [ ] Tech Demonstration

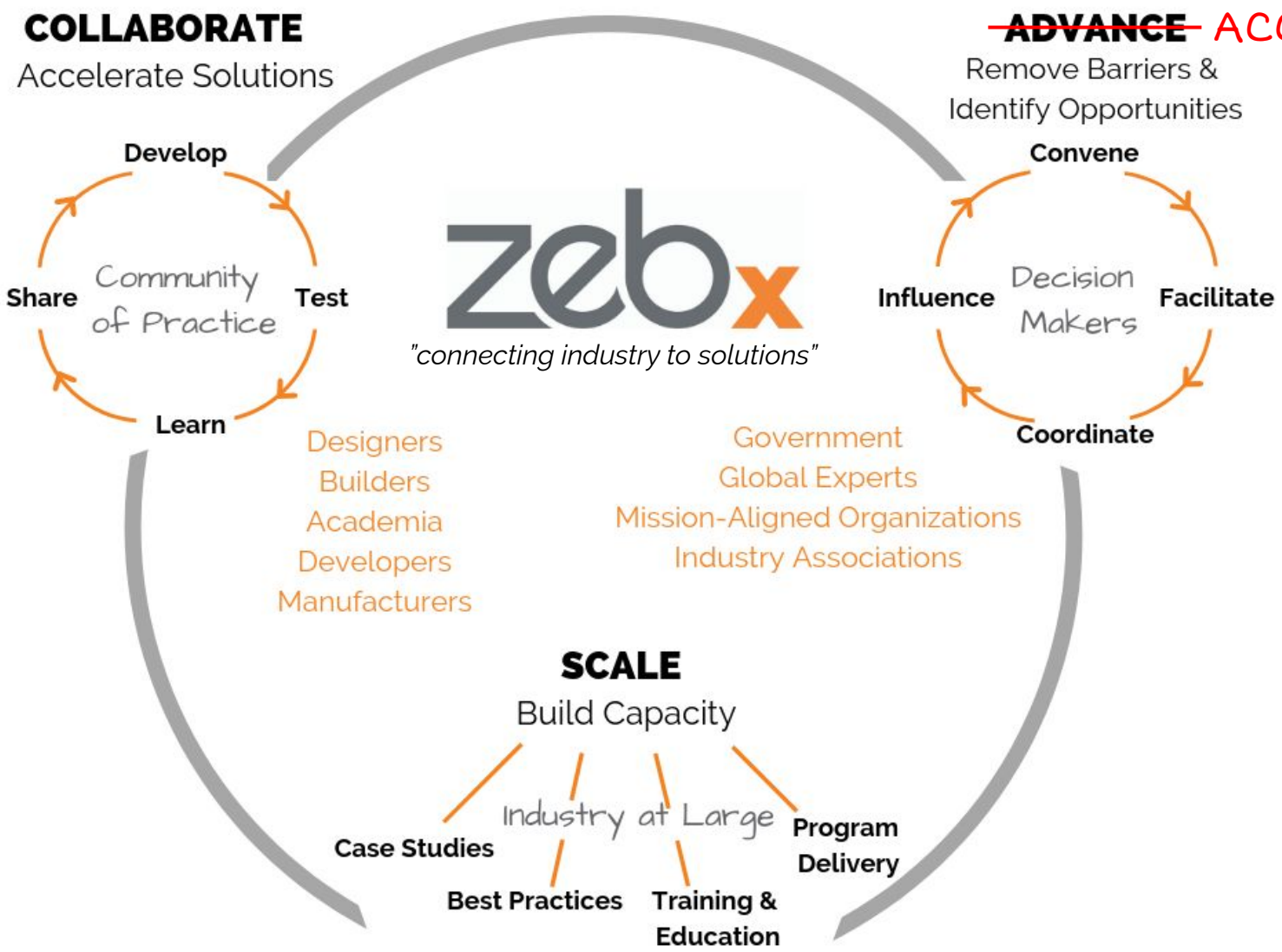
Systems:

- [ ] Building Enclosure
- [ ] Domestic Hot Water Heat Pump
- [ ] Geothermal
- [ ] Mechanical

The ZEBx Podcast Decarb Lunch Jan 2022: Reducing Embodied Carbon for Step Code Homes

The ZEBx Podcast Decarb Lunch Oct 2021: From Net-Zero Energy to Near-Zero Emissions

The ZEBx Podcast Decarb Lunch Jul 2021: Developer/Builder Recipes for Low-Cost, All-Electric, Step 4 Residential Construction


COLLABORATE
Accelerate Solutions
Develop
Test
Learn
Share
Community of Practice
~~ADVANCE~~ ACCELERATE
Remove Barriers & Identify Opportunities
Convene
Facilitate
Coordinate
Influence
Decision Makers
zebx
"connecting industry to solutions"
Designers
Builders
Academia
Developers
Manufacturers
Government
Global Experts
Mission-Aligned Organizations
Industry Associations
SCALE
Build Capacity
Industry at Large
Case Studies
Best Practices
Training & Education
Program Delivery

zebx.org

We are a broad coalition working together to electrify buildings in British Columbia in order to reduce their climate impacts and reliance on fossil fuels.

B2E

Events Resources FAQ About ZEBx Contact **Get Involved**

Become a Member

Becoming a member of B2E is simple and free. As a member you will enjoy the following benefits:

- Numerous collaboration opportunities with industry leaders through working groups, subcommittees, B2E events, case study development, and publishing online articles;
- Early access to building electrification news, updates and events;
- Recognition on B2E website and acknowledgement that your organization is fully engaged in the decarbonization of the building sector.

Join B2E

What is Building Electrification?

Building electrification is about making the shift away from fossil-fuels and using low-carbon electricity for space heating, hot water and cooking.

Instead of using natural gas or propane to run appliances like furnaces, kitchen stoves, washers and dryers, everything is electric.

Read more about building electrification on our FAQ page.

View FAQ

b2electrification.org

clfvancouver.com

PROJECT BROUGHT TO YOU BY:

PASSIVEHOUSE CANADA Build better. Feel better.

CITY OF VANCOUVER

GREENEST CITY

ZEBx ZERO EMISSIONS BUILDING EXCHANGE

cleanBC our nature. our power. our future.

Currently fully subscribed, but stay tuned for a new incentive stream …. coming soon!

NearZero.ca

To be eligible to participate in the program, the following criteria must be met:

- The single-family house must have a gross floor area (excluding an attached garage, if any) of less than 400m^2 (4,300 square feet).
- If the building contains more than one unit, the largest unit cannot exceed 400m^2 and the building must be a Part 9 building as defined by the BC Building Code or Vancouver Building Bylaws.
- The property must be located in the City of Vancouver or a Metro Vancouver municipality that has adopted the BC Energy Step Code (click here for adopting municipalities). If the property is located in another municipality within Climate Zone 4, the program administrator *may* accept the application based on the uniqueness or degree of innovation of the design and/or construction. For projects located throughout BC, a variety of other incentives can be found at betterhomesbc.ca.
- The design must satisfy the requirements for Step 4 or 5 of the BC Energy Step Code or Passive House certification.
- The design must include a heat pump or electric resistance heating to satisfy the majority of the space heating requirements.
- If the building is already under construction, the construction must have begun within one year of the application date.

Preference will be given for the following projects:

- The Issued for Construction drawings are complete.
- The design includes heat pumps for generating domestic hot water.
- The design includes a heat pump for space heating/cooling.

While each project application will be assessed according to the above-noted selection criteria, by applying to the program, the participants acknowledge that the program administrator will have the final decision to select projects.

cleanBC BETTER BUILDINGS

NET-ZERO ENERGY-READY CHALLENGE

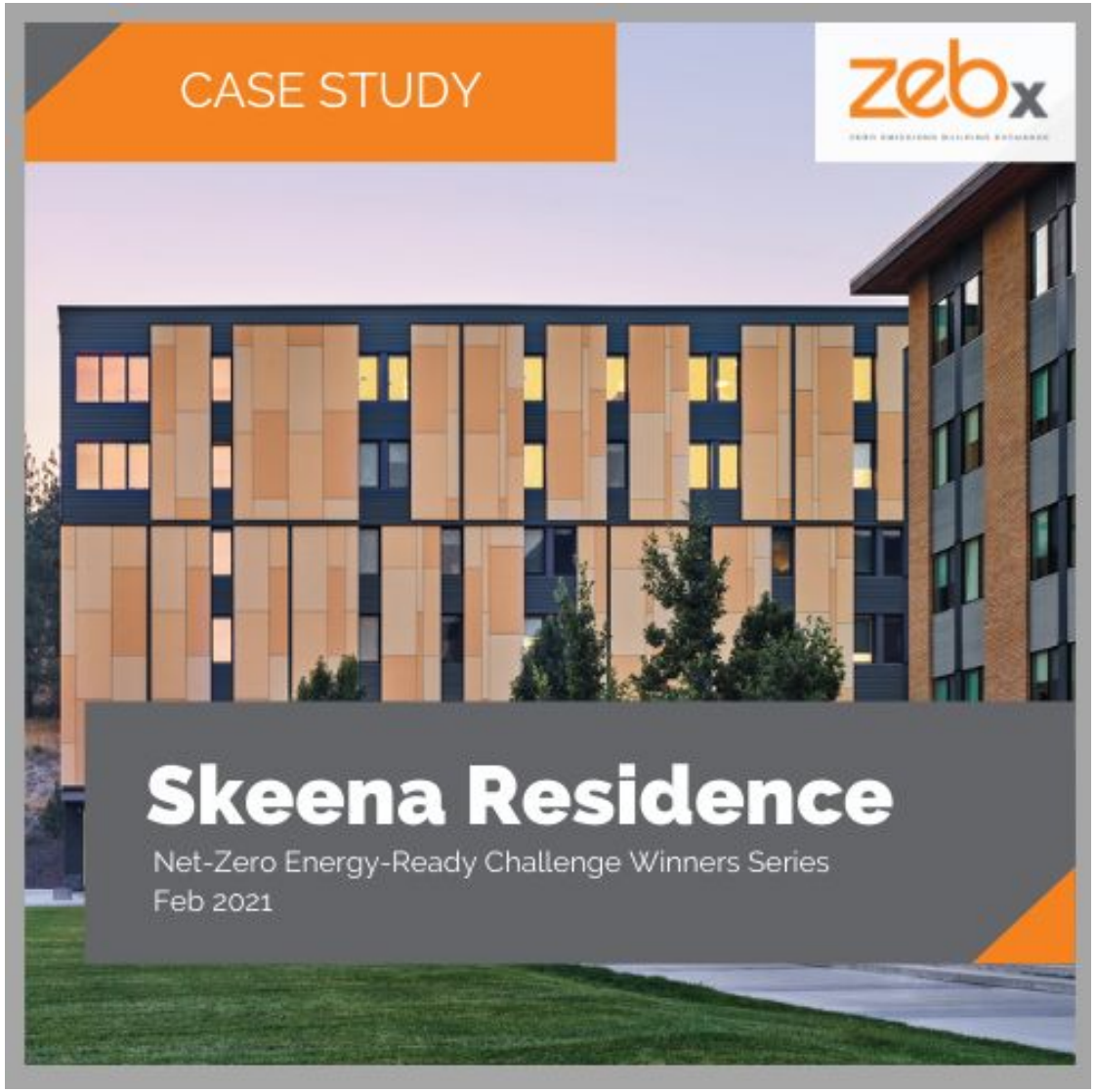
PLAYBOOK SERIES

- Ventilation Strategies for High-Performance MURBs
- Planning Airtight Buildings
- LCA Practice to Estimate Embodied Carbon
- Thermal Bridging
- Low-Carbon Energy Systems
- Planning High-Performance Buildings

www.zebx.org/resources

www.zebx.org

www.zebx.org/resources



ARTICLE

Marketing the High-Performance Home

Sep 2021

www.zebx.org/resources

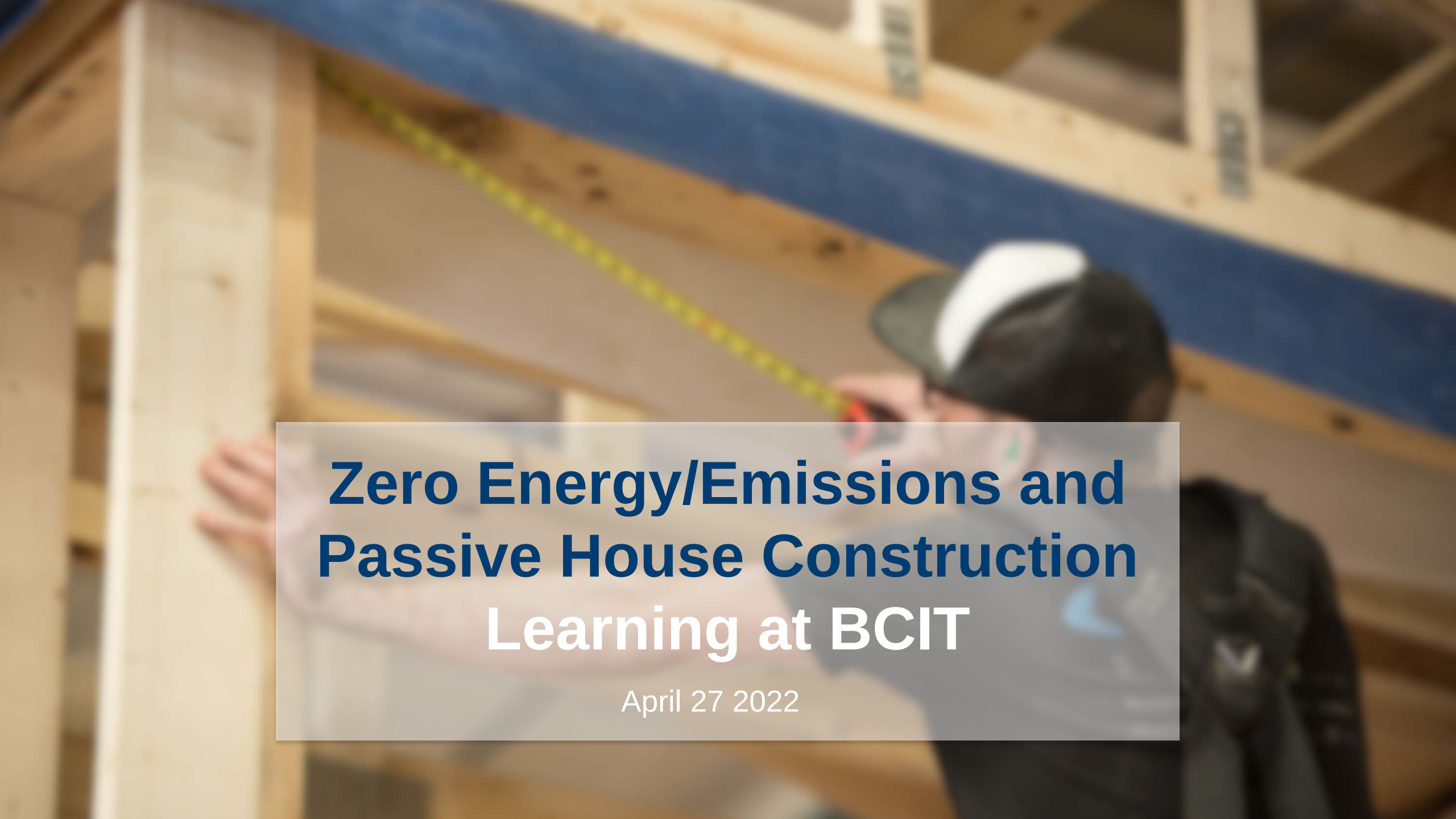
POLL 1

Tell us about yourself!

Three-part anonymous poll

BCIT™

zebx

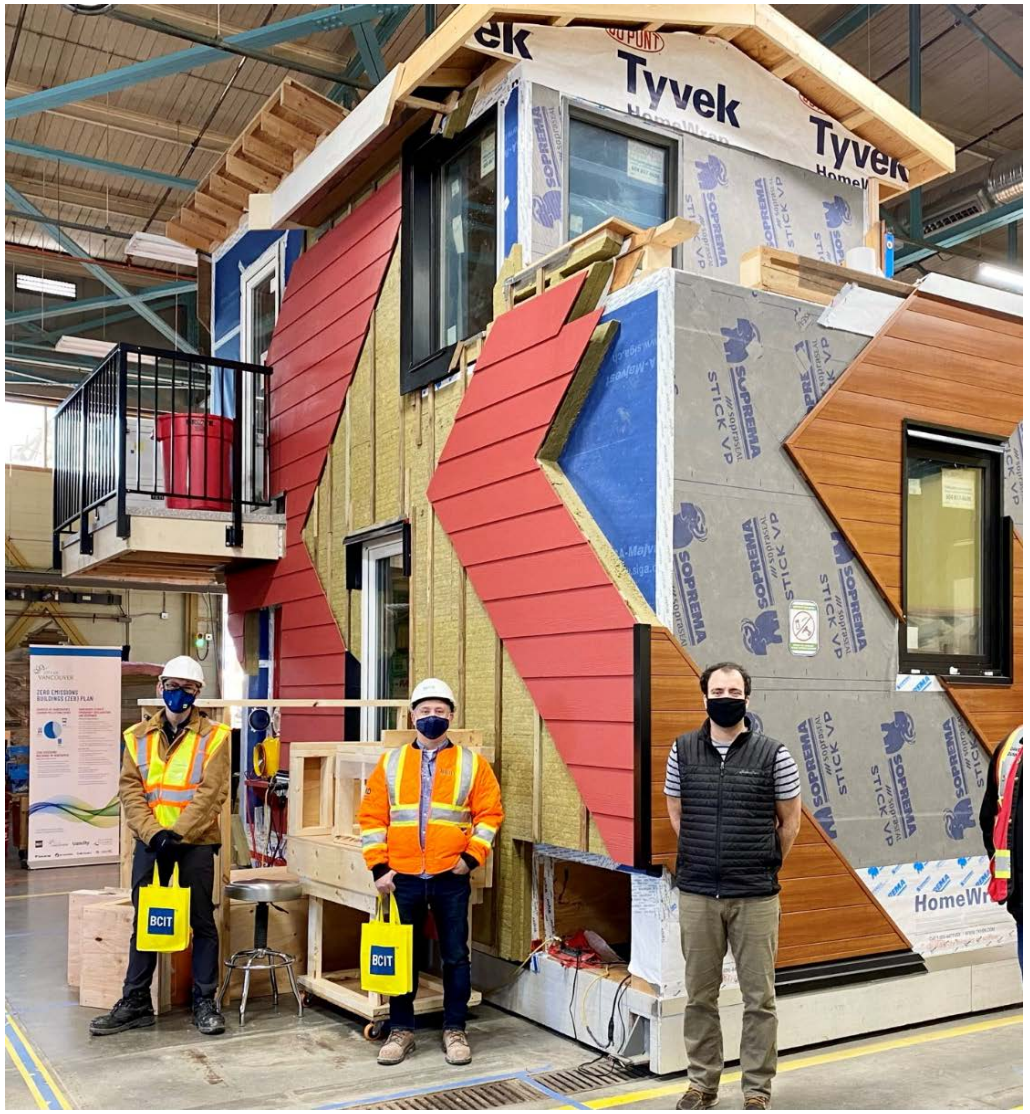


Zero Energy/Emissions and Passive House Construction Learning at BCIT

April 27 2022

About Us

- Learning Centre established to support industry
- Hands-on Passive House and Net Zero Energy-ready training since 2016
- Spring 2022 launched New Microcredentials:
  - **Essentials of Net-Zero and Passive House Construction**
  - **Supervising Net-Zero and Passive House Construction**

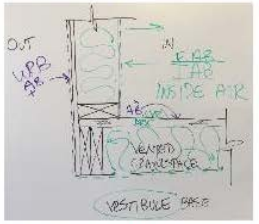


What We've Learned

about airtightness

Hands-on learning is best

- Mock-ups for demonstration and investigation
- Mock-up construction
- Testing of work



What We've Learned

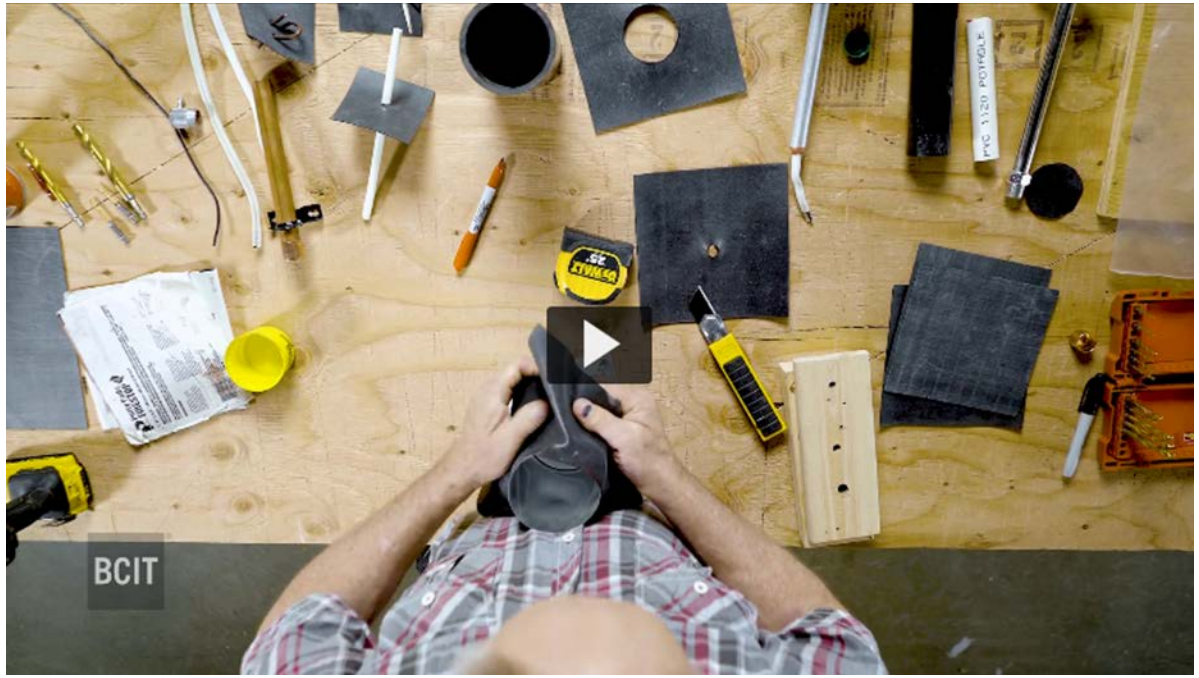
about airtightness

Online learning can work

- Live interaction with instructors
- Front seat view of hands-on work
- Review of construction drawings and inspection of mockups

Just in time learning is needed

- Library of on-demand technical videos
- Job aids for quick reference
- Job-ready checklists



What We've Learned

about airtightness

Learner feedback

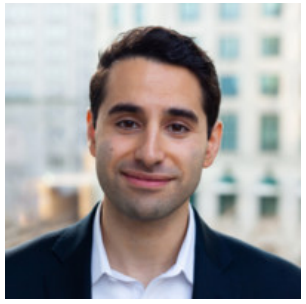
- 95% satisfied with the knowledge gained
- 95% confident to make decisions to achieve <1.0 ACH
- 75% confident can build to achieve <1.0 ACH on next project
- Methods or practices introduced are implemented onsite with high success
- Hands-on lab learning still wanted

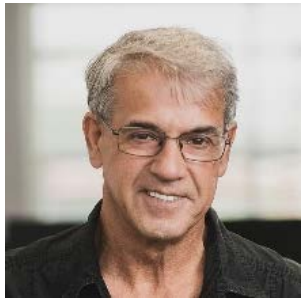
BCIT

What We've Learned

Industry expertise from a wide variety of roles in Part 3 & Part 9 design & construction





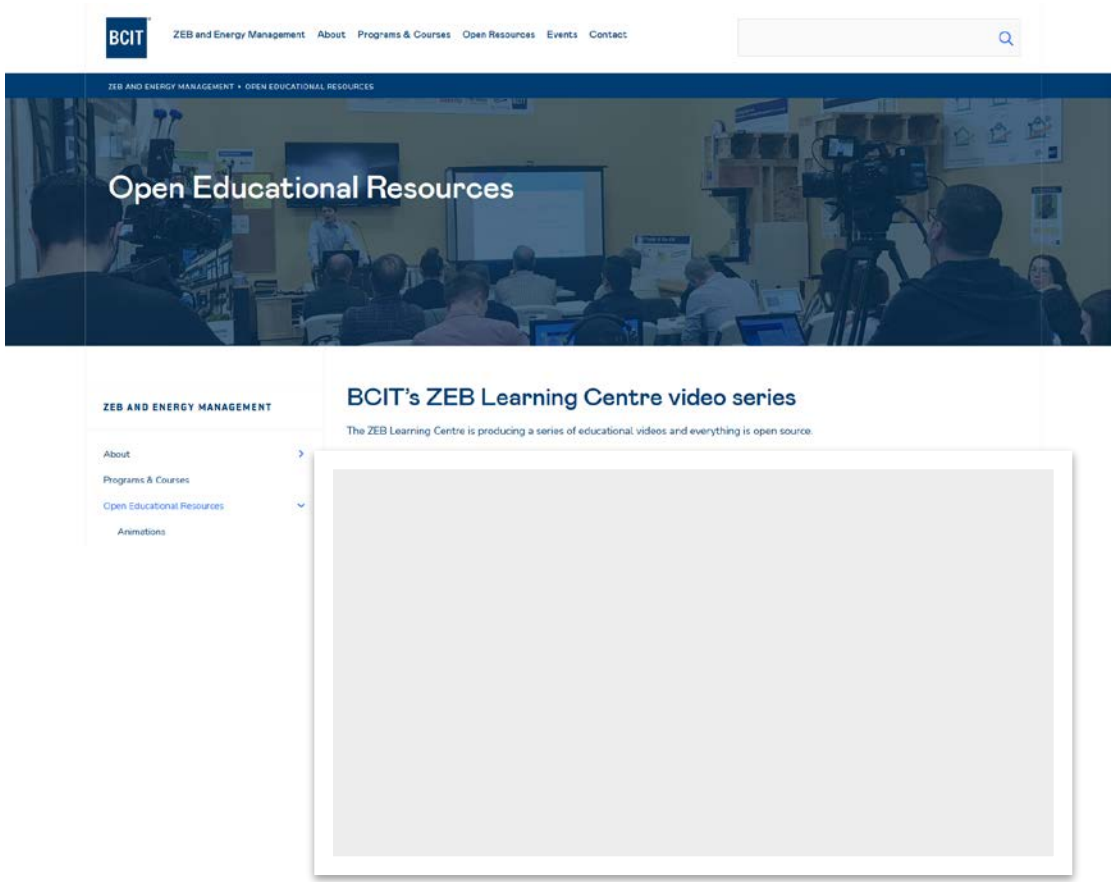



2021 CaGBC Inspired Educator of the year

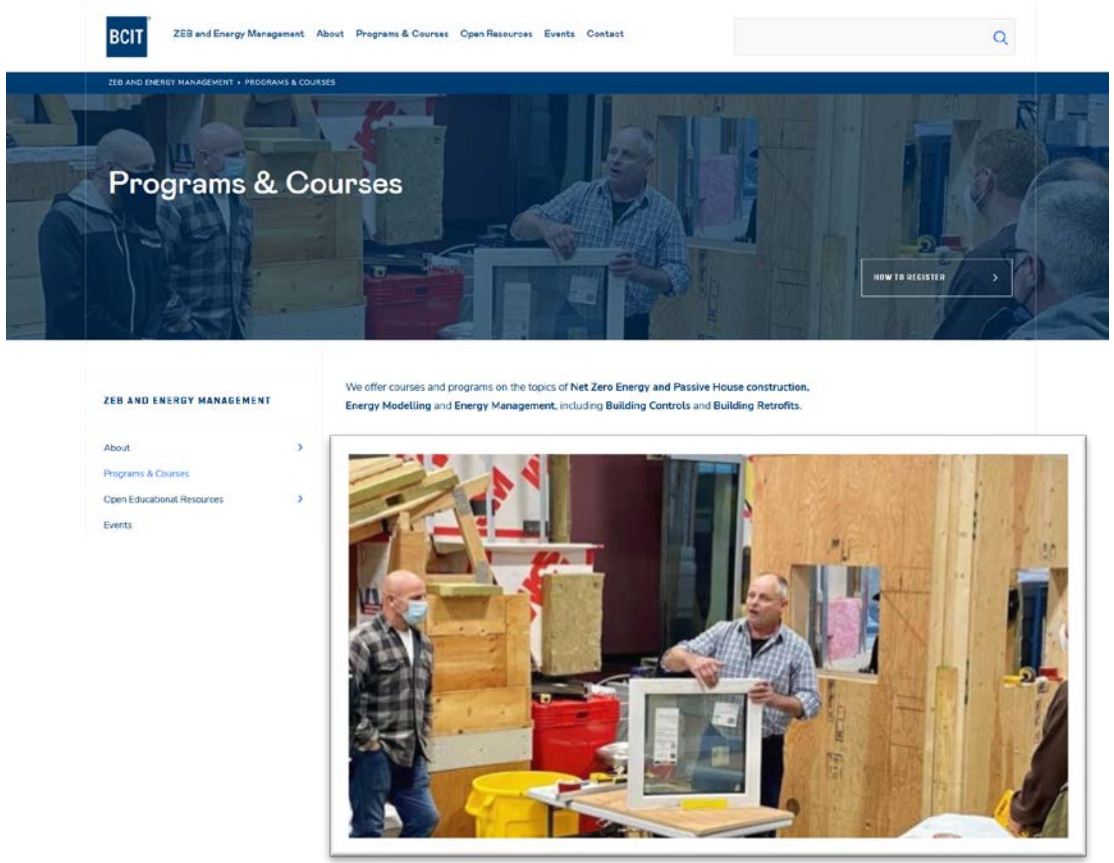
2022 VRCA Educational Leadership Award



Net Zero and Passive House Continued Learning



Open Ed. Resources



Programs & Courses

www.bcit.ca/zeb

Thank you

Mary McWilliam
ZEB Learning Centre
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Spring 2022 - New Microcredentials:

Essentials of Net-Zero and Passive House Construction
www.bcit.ca/zebessentials

Supervising Net-Zero and Passive House Construction
www.bcit.ca/zebsupervising

ZERO ENERGY/EMISSIONS BUILDINGS
LEARNING CENTRE

BCIT

POLL 1

What did you tell us about yourself?

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EconGroup

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BCIT BRITISH COLUMBIA INSTITUTE OF TECHNOLOGY

North Vancouver Passivehouse Airtightness Strategy

EconGroup

Integrated building solutions

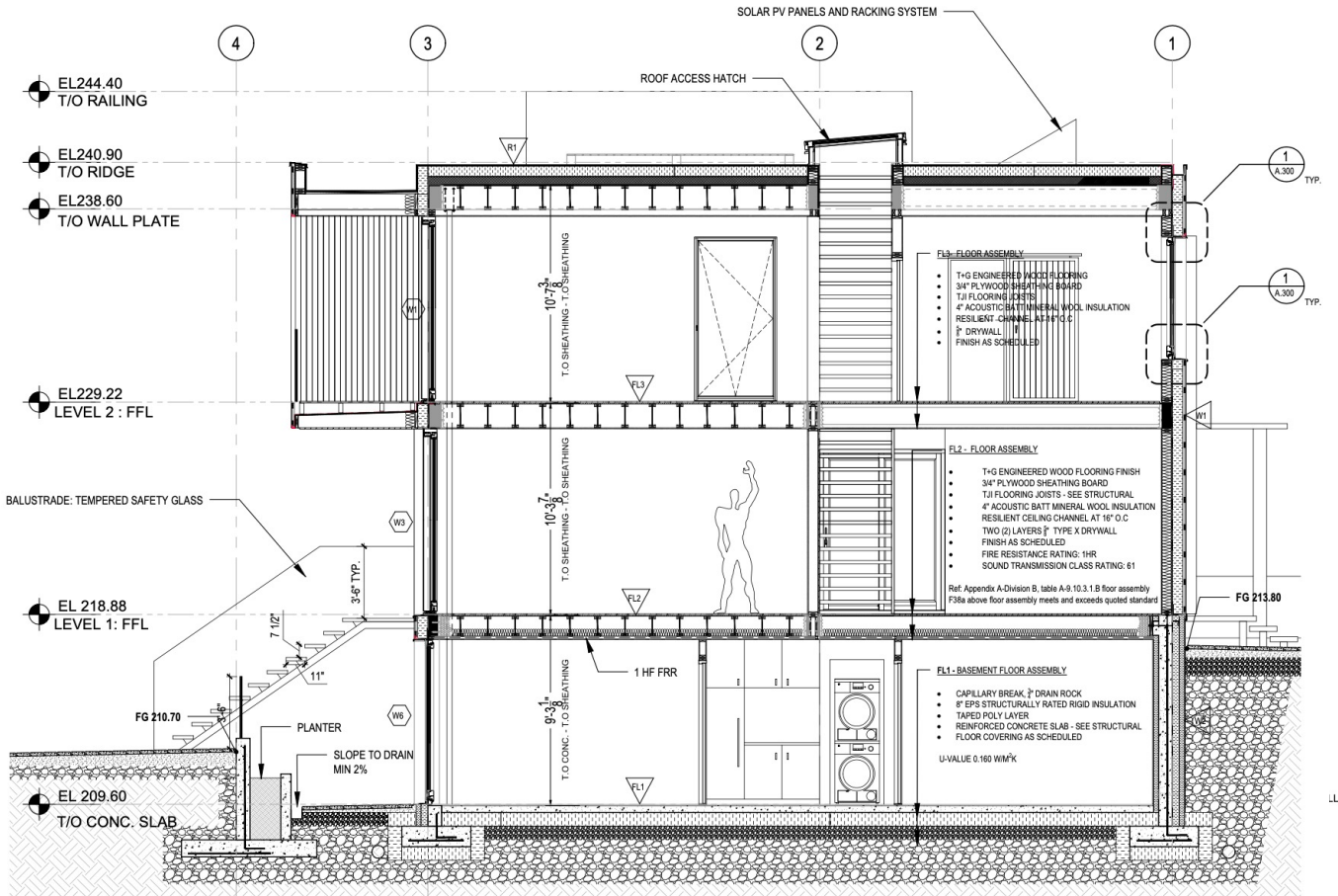
econgroup.ca

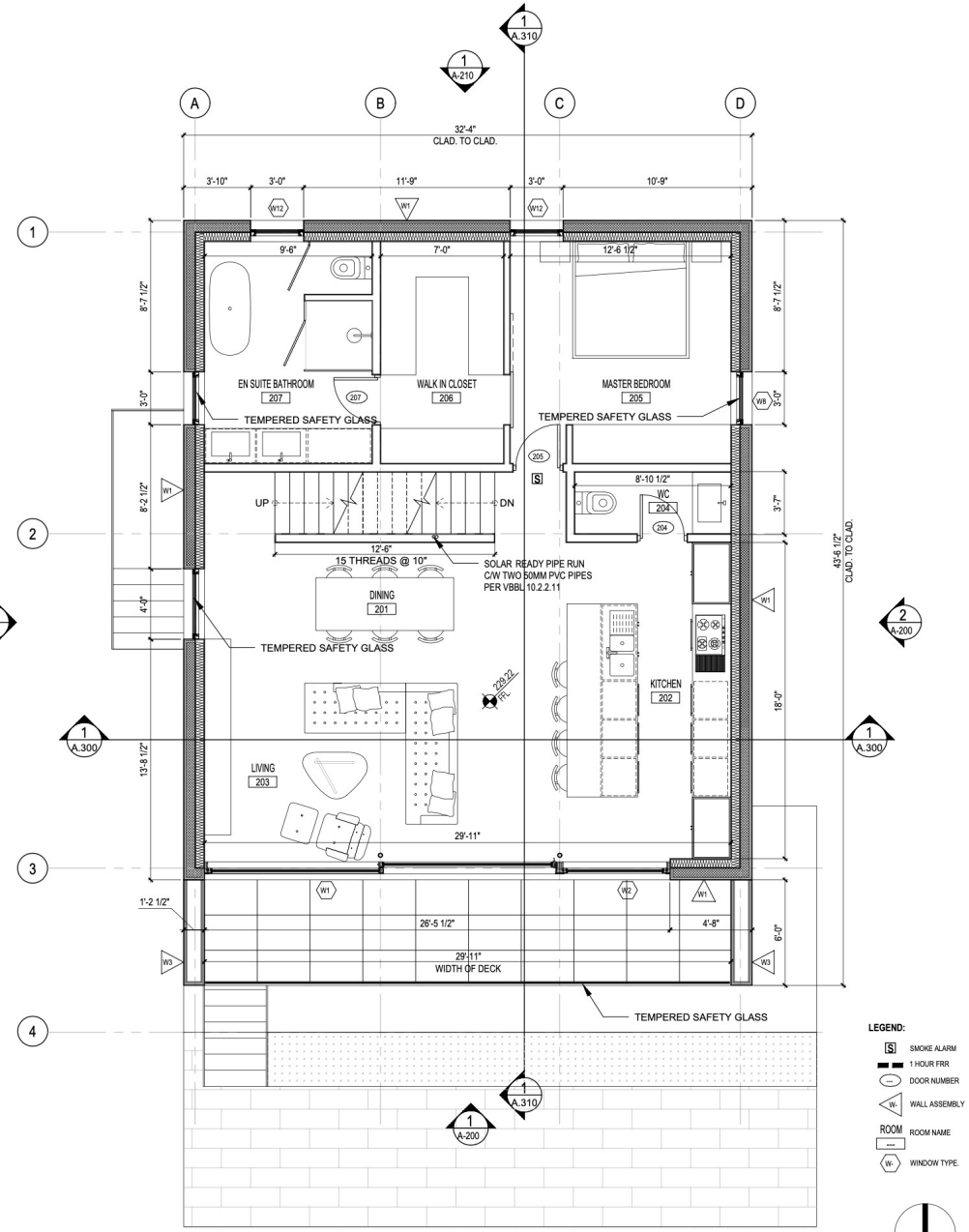
Single-Family / design – built Passivehouse Residence

Located in North Vancouver in the Moodyville area.

- 3 stories wood frame with suite on basement level
- 3300sqft total area (TFA=270m2)
- Wall assembly: 2x6 with 6” outboard mineralwool
- Wood metal clad triple glazed windows (PH certified)
- Electric fancoil in HRV to heat
- CO2 air to water heatpump for DHW
- Passivehouse certified project

Plans





1 A-100 FLOOR PLAN - LEVEL TWO
1/4" - 1'-0"

FLOOR AREA 1122 SQFT
SPRINKLERED

Blower Door Test Result

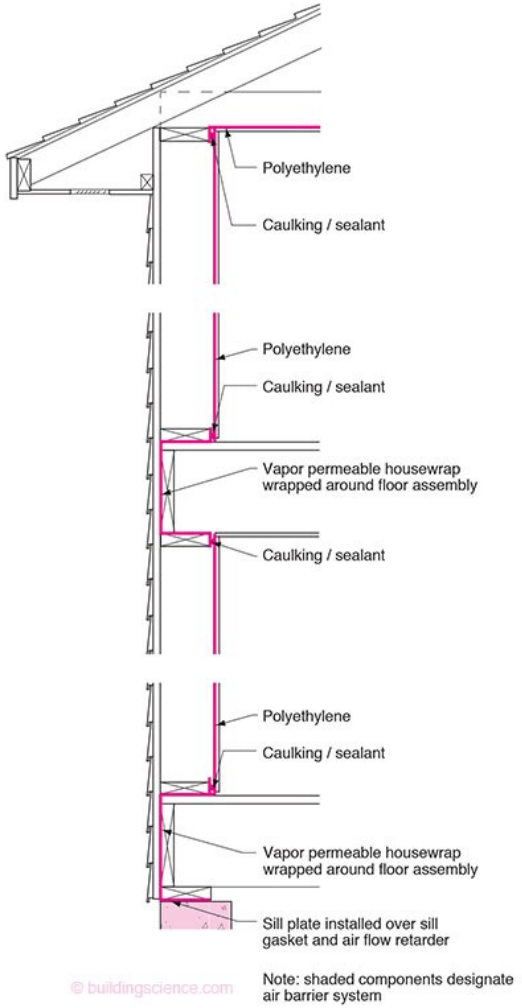
Summary

Software Used:	HOT2000 - Version 11.9
Completed by:	Ross Michel, Certified Energy Advisor
Client:	Econ Group Construction and Developments Ltd.
Building Address:	433 East 6th Street, North Vancouver, British Columbia, Canada
Date of Testing	November 20th, 2020

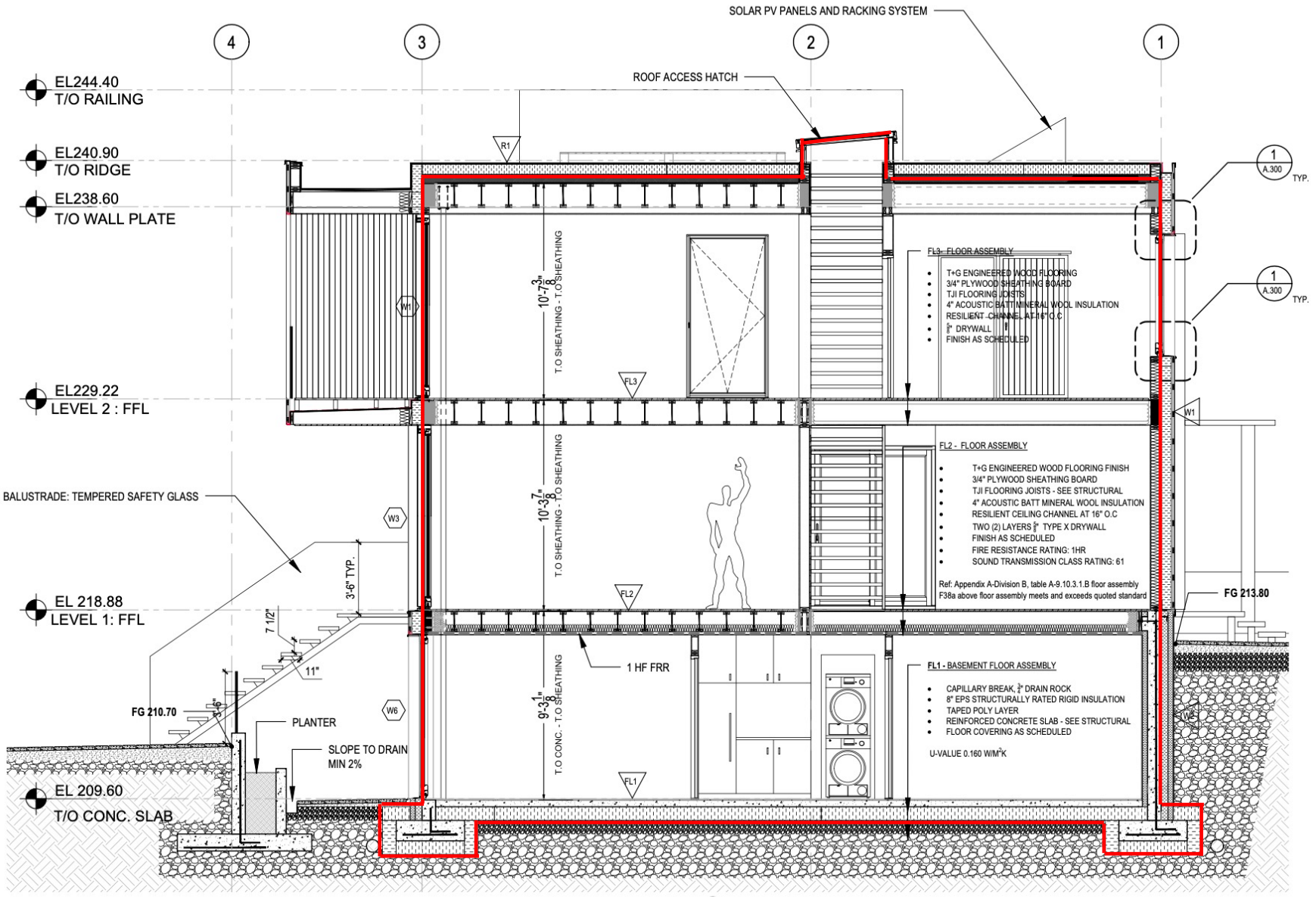
Building and Test Information	
Test file:	Two files, depressurization/pressurization
Building volume [m³]:	673.4
Envelope Area [{m²]:	633.4
Floor Area [{m²]:	269.4
Building Height (from ground to top) [m]:	8.6

Results	
Average Air changes at 50 Pa, n_{50} [/h]	0.285
Depressurization Air changes at 50 Pa, n_{50} [/h]	0.30
Pressurization Air changes at 50 Pa, n_{50} [/h]	0.27
Target Hit (Pass/Fail):	**Pass**

Airtightness strategy



Airtightness strategy



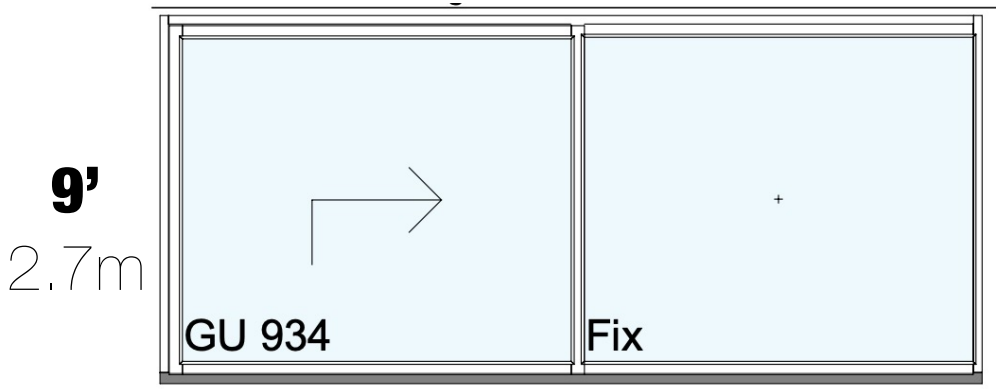
Airtightness strategy

Airtightness strategy

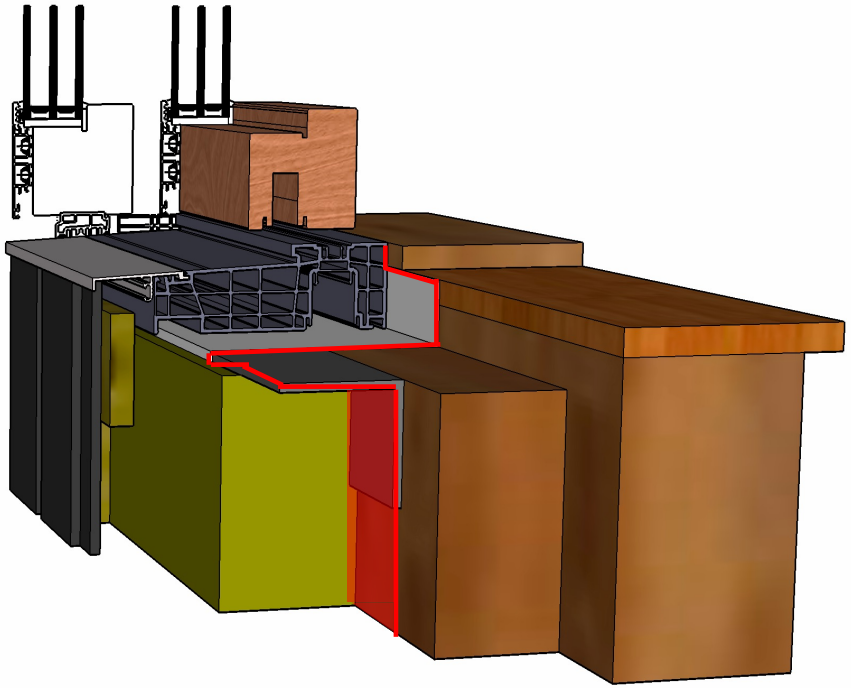
Airtightness strategy

Airtightness strategy

Airtightness challenges



Airtightness challenges



Passive House Verification

Architecture:	Econ Group Ltd	
Street:	402-510 Chesterfield Ave	
Postcode/City:	V7M 2L9	North Vancouver
Province/Country:	BC	CA-Canada
Energy consultancy:	Econ Group Ltd	
Street:	402-510 Chesterfield Ave	
Postcode/City:	V7M 2L9	North Vancouver
Province/Country:	BC	CA-Canada

Year of construction:	2021	Interior t
No. of dwelling units:	2	Internal heat gains (IHG
No. of occupants:	5.6	Specific capa

Specific building characteristics with reference to the treated floor area

	Treated floor area	m²	269.4
Space heating	Heating demand	kWh/(m²a)	7.0
	Heating load	W/m²	8.4
Space cooling	Cooling & dehum. demand	kWh/(m²a)	-
	Cooling load	W/m²	-
	Frequency of overheating (> 25 °C)	%	4
	Frequency excessively high humidity (> 12 g/kg)	%	0
Airtightness	Pressurization test result n_{50}	1/h	0.285
Non-renewable Primary Energy (PE)	PE demand	kWh/(m²a)	66
Primary Energy Renewable (PER)	PER demand	kWh/(m²a)	29
	Generation of renewable energy	kWh/(m²a)	

Airtightness Impact on Heating Energy

	Treated floor area	m²	269.4
Space heating	Heating demand	kWh/(m²a)	14
	Heating load	W/m²	16
Space cooling	Cooling & dehum. demand	kWh/(m²a)	-
	Cooling load	W/m²	-
	Frequency of overheating (> 25 °C)	%	3
	Frequency excessively high humidity (> 12 g/kg)	%	0
Airtightness	Pressurization test result n_{50}	1/h	2.5
Non-renewable Primary Energy (PE)	PE demand	kWh/(m²a)	73
Primary Energy Renewable (PER)	PER demand	kWh/(m²a)	32
	Generation of renewable energy	kWh/(m²a)	

Forming Part of Sentence 9.36.6.3.(1)

STEP	AIRTIGHTNESS (AIR CHANGES PER HOUR AT 50 PA PRESSURE DIFFERENTIAL)
1	N/A
2	≦ 3.0
3	≦ 2.5
4	≦ 1.5
5	≦ 1.0

EconGroup

Integrated building solutions

2-1350 Delbruck Ave
North Vancouver
BC V7M 2Y9

T 604.618.0284
E info@econgroup.ca
www.econgroup.ca

Legendary Airtightness

The Most Airtight Homes of the NearZero Program

3612 Point Grey Road, Vancouver

KINGDOM BUILDERS

CITY OF VANCOUVER

zebx

Meet the project team.

Architect: Uegama Custom Design

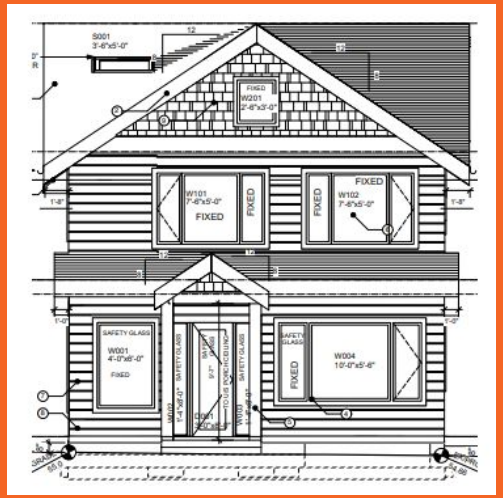
Energy Modelling: Domus Home Energy

Structural: Horace Engineering

Interiors : Jamie Banfield Interior Design

Clients: John Baldwin & Linda Bily

Builder: Kingdom Builders Inc



Meet Kingdom Builders.

17 years building custom homes

Built first certified Passive House in 2016

All high performance homes built with an air tightness of 0.19 - 0.33 ACH

3612 Point Grey

Simple form, character suits neighborhood

Part 9 building

Zoning: RT-8

Lot size: 33’ x 106’

Floor Space: 1597 sq ft (148 sq m)

House Dimensions: 26.3’ x 32.2’

Height: 29 ft above slab

Floorplan: 2 floors, 2 bathrooms, 2 bedrooms, office and den, no basement

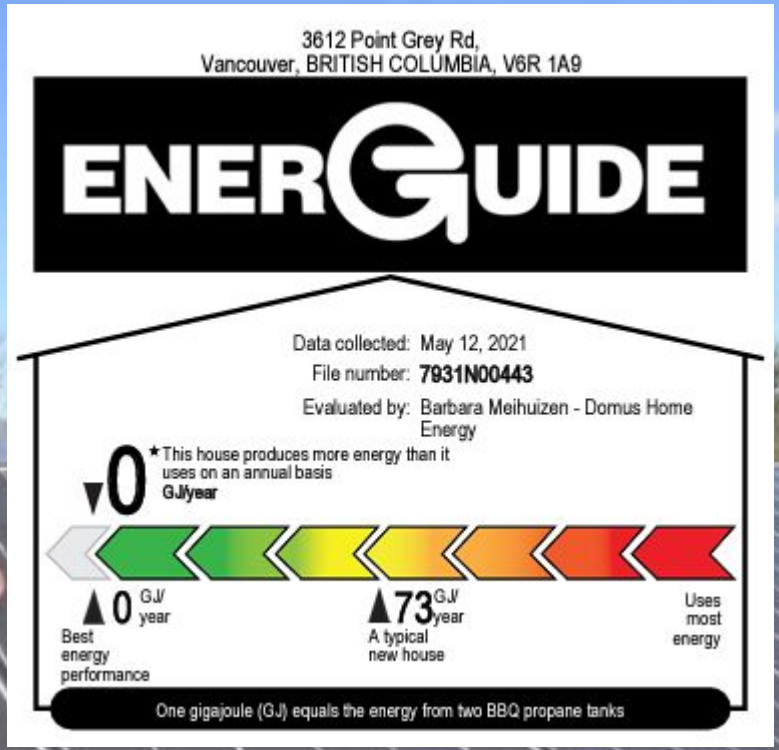
Project Results

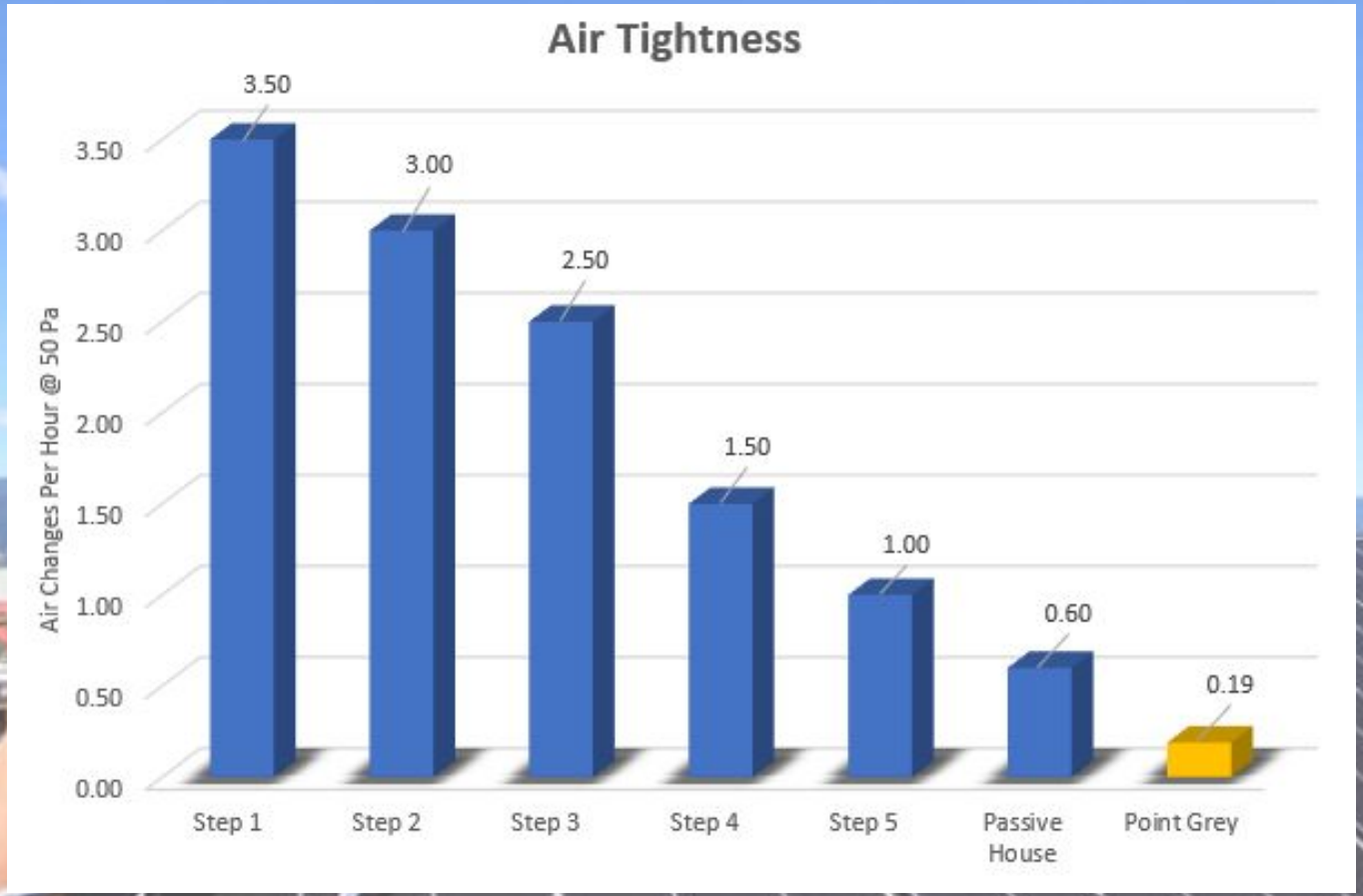
Air tightness: 0.19 ACH @ 50Pa, no Aero Barrier

Net Zero

Total energy use: 34 GJ/yr

Renewable energy generation: 37 GJ/yr




Air Tightness
Air Changes Per Hour @ 50 Pa
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
3.50
3.00
2.50
1.50
1.00
0.60
0.19
Step 1
Step 2
Step 3
Step 4
Step 5
Passive House
Point Grey

Air barrier design principles

Uniform

Protected

Collaboration

Slab on grade, R30

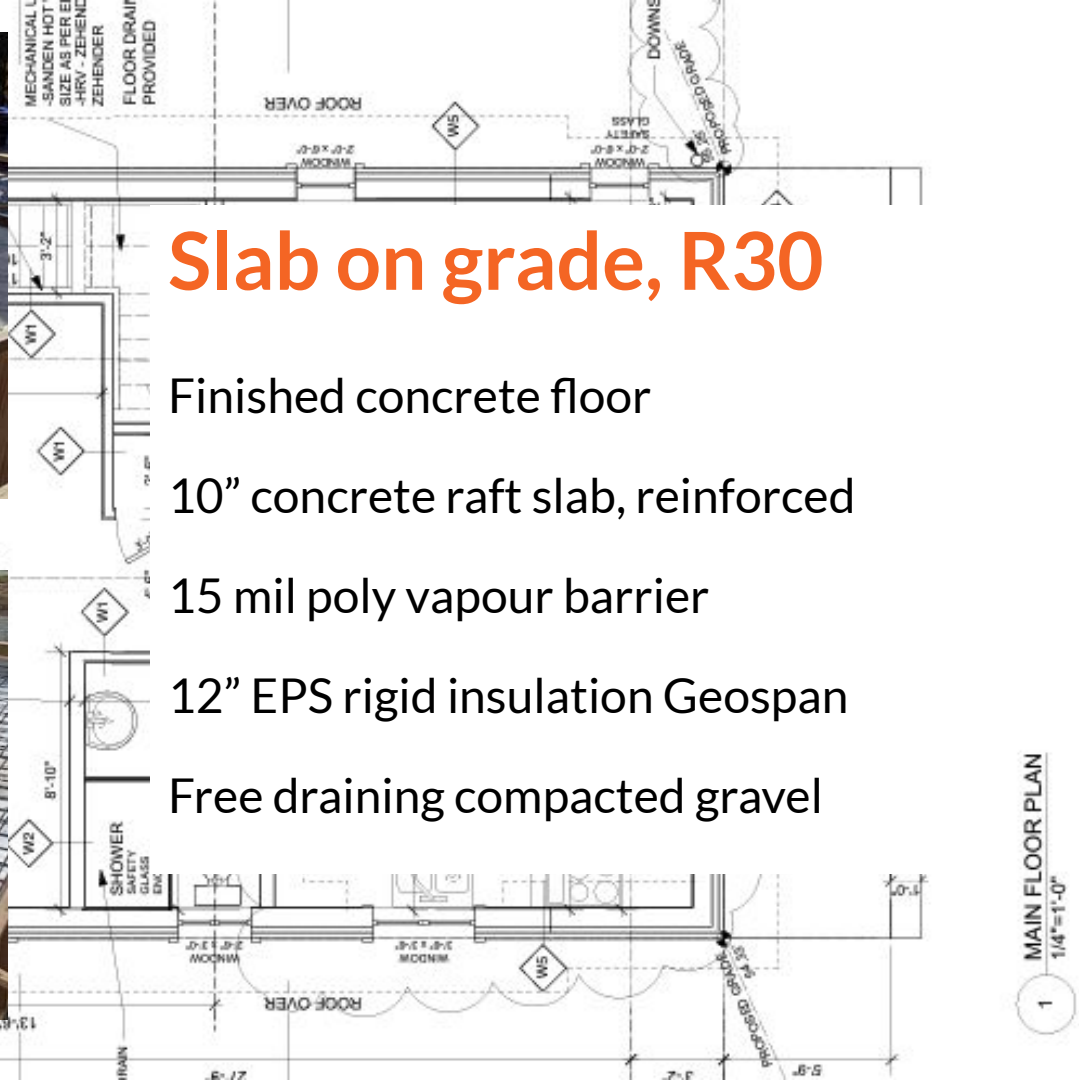
Finished concrete floor

10” concrete raft slab, reinforced

15 mil poly vapour barrier

12” EPS rigid insulation Geospan

Free draining compacted gravel



Exterior wall, R32

Vapour barrier paint

½” drywall

2x6 studs with fiberglass batt insulation

½” plywood

Siga Majvest 500 SA air barrier

4” cascadia clip with Cavity Rock insulation

Hardieplank horizontal siding

Roof, R31

Metal roofing

High temperature peel & stick

½” plywood

2x4 cross strapping for ventilation

2-½” Rockwool insulation

2x4 over framing for cantilever

Siga Majvest 500 SA air barrier

½” plywood

2x10 joists with batt insulation

½” drywall

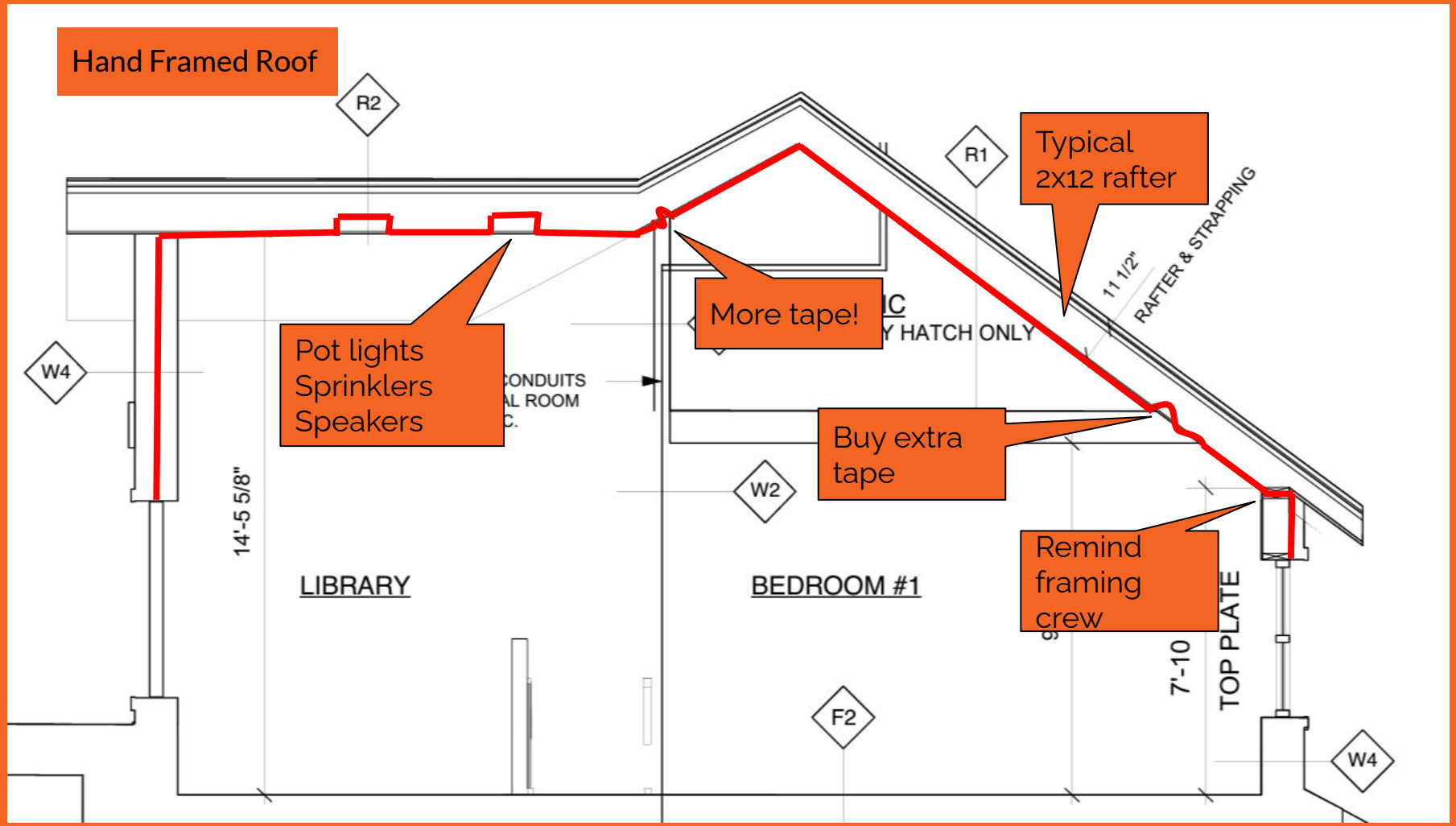
Vapour barrier paint

What have we learned?

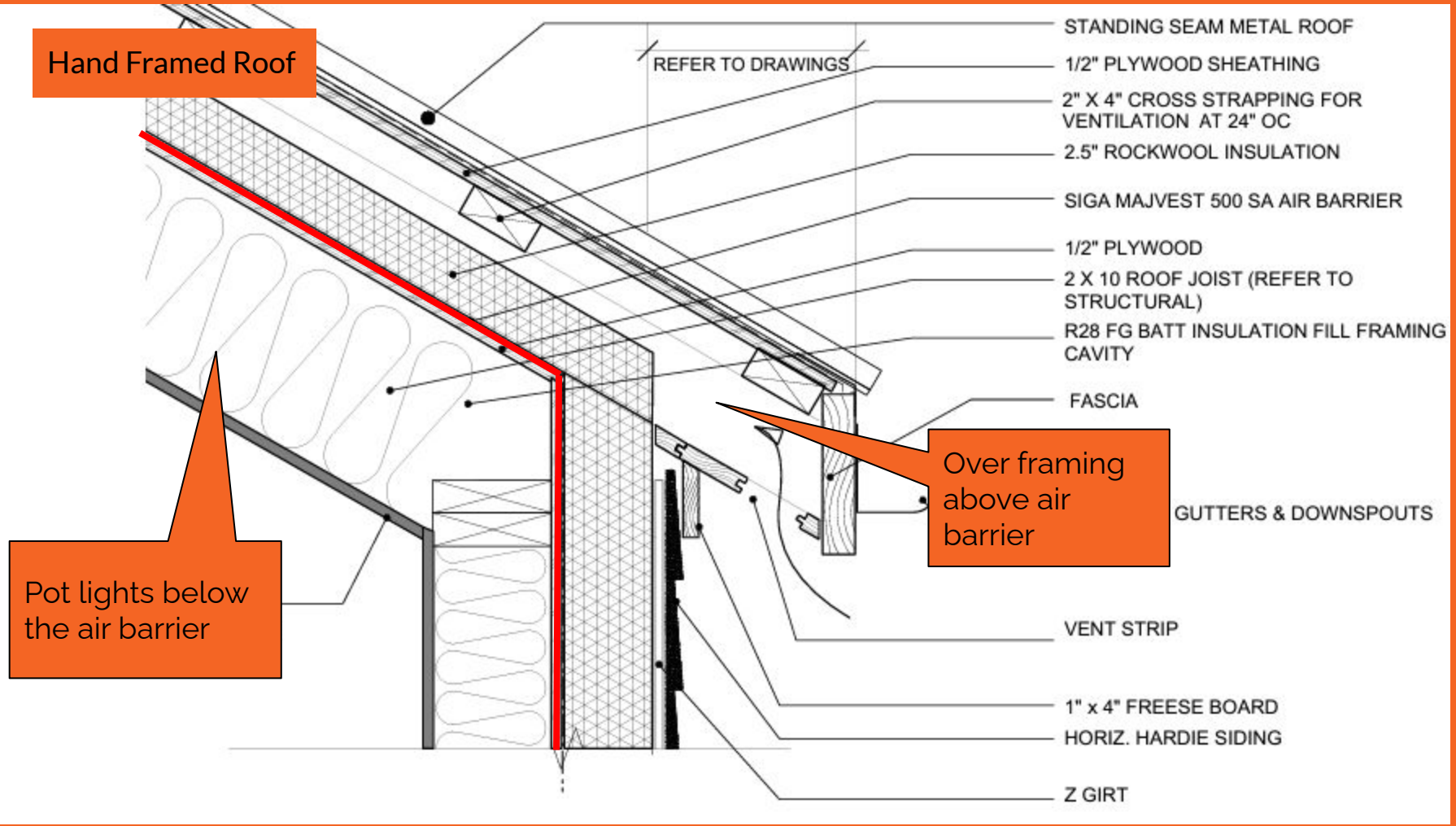
Design a good roof assembly

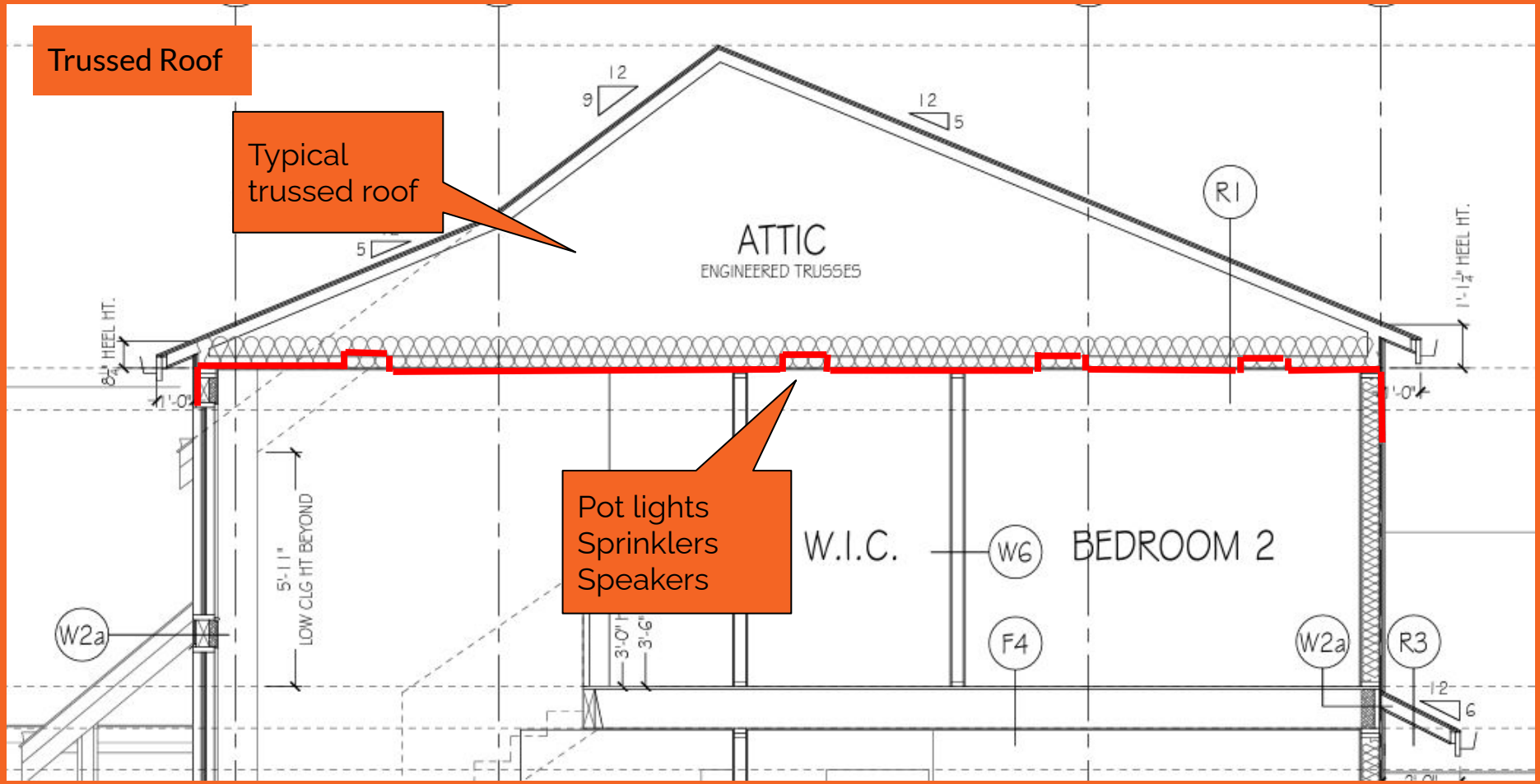
How to implement the details

Hand Framed Roof

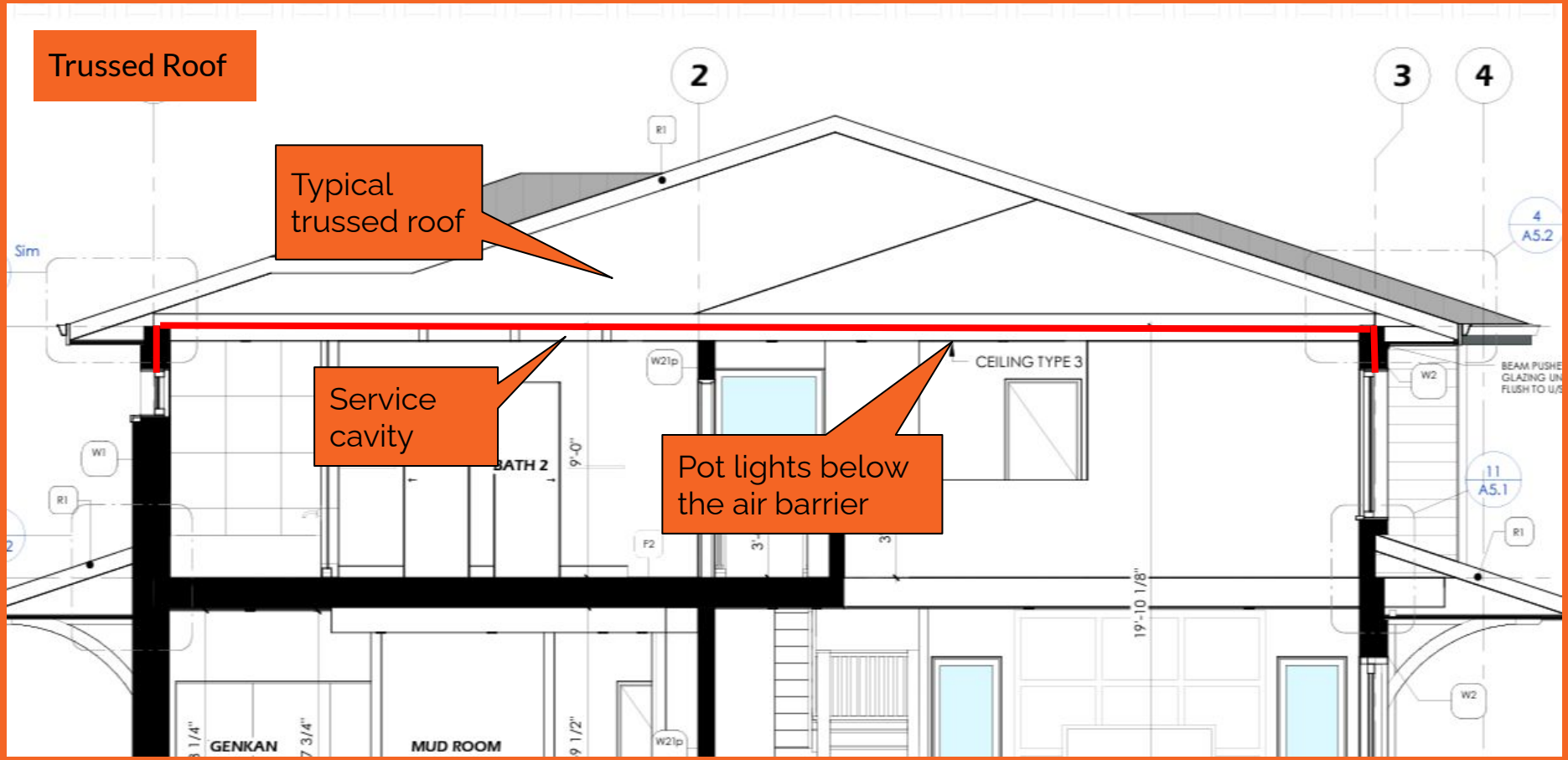


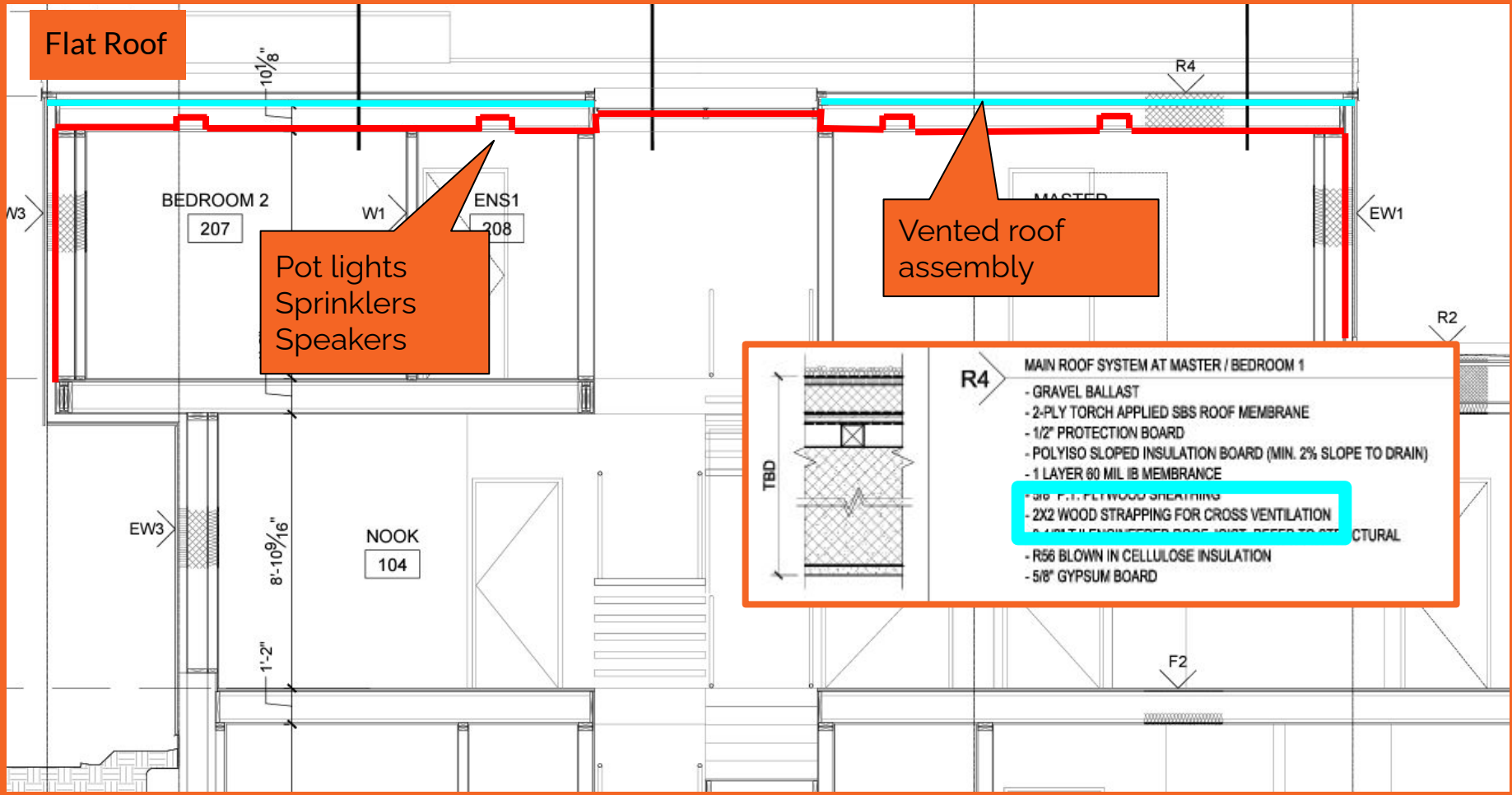
Hand Framed Roof

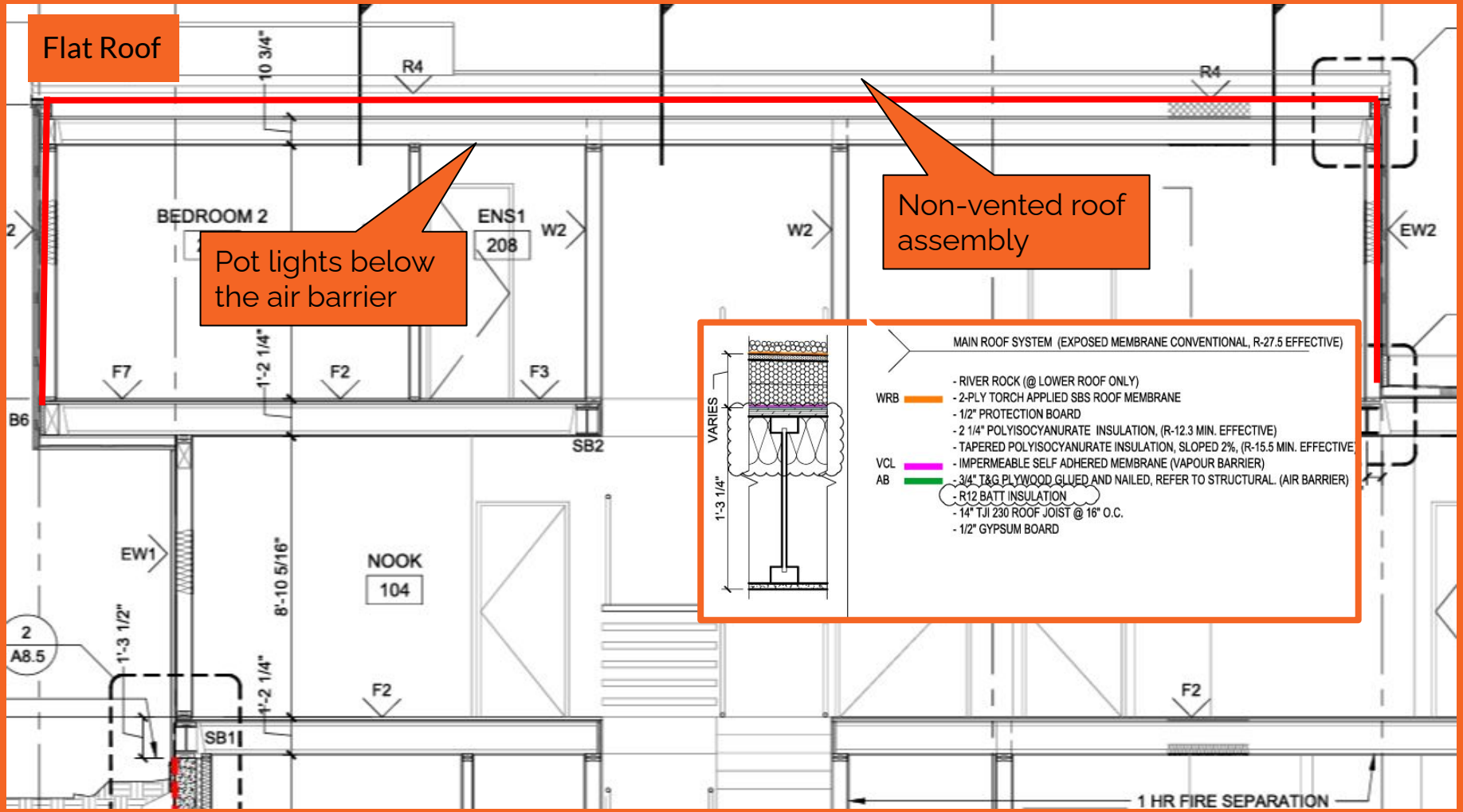



Trussed Roof
Typical trussed roof
Pot lights
Sprinklers
Speakers
ATTIC
ENGINEERED TRUSSES
W.I.C.
W6
BEDROOM 2
F4
W2a
R1
R3
12
9
12
5
5
6
8½" HEEL HT.
1'-0"
5'-11"
LOW CLG HT BEYOND
3'-0"
3'-6"
1'-1¼" HEEL HT.
1'-0"

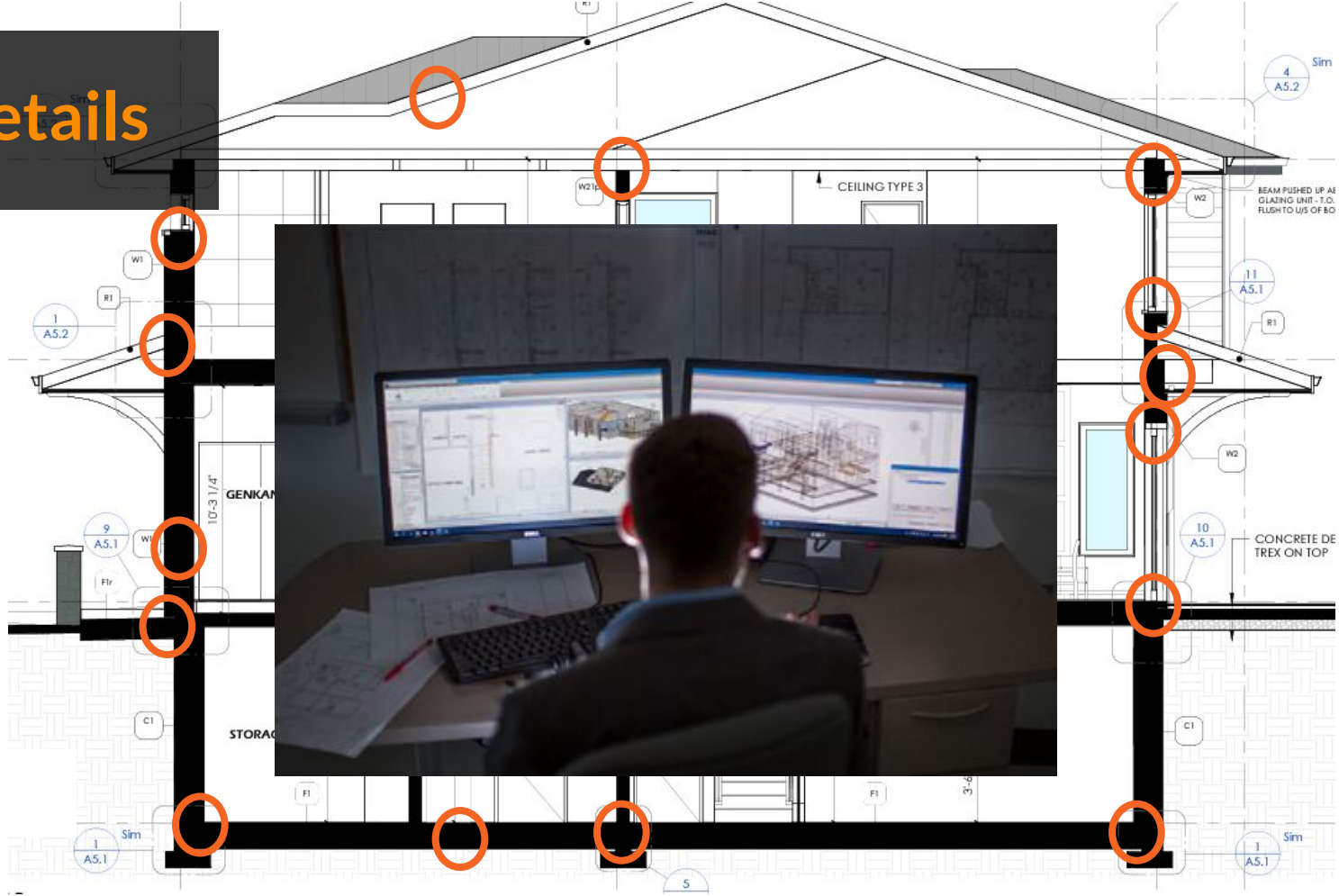
Trussed Roof




Flat Roof
10 1/8"
R4
BEDROOM 2
207
W1
ENS1
208
W3
EW1
Pot lights
Sprinklers
Speakers
Vented roof
assembly
R2
TBD
R4
MAIN ROOF SYSTEM AT MASTER / BEDROOM 1
- GRAVEL BALLAST
- 2-PLY TORCH APPLIED SBS ROOF MEMBRANE
- 1/2" PROTECTION BOARD
- POLYISO SLOPED INSULATION BOARD (MIN. 2% SLOPE TO DRAIN)
- 1 LAYER 60 MIL IB MEMBRANCE
- 2X2 WOOD STRAPPING FOR CROSS VENTILATION
- R56 BLOWN IN CELLULOSE INSULATION
- 5/8" GYPSUM BOARD
EW3
8'-10 9/16"
NOOK
104
1'-2"
F2


Flat Roof
Pot lights below the air barrier
Non-vented roof assembly
BEDROOM 2
ENS1
208
W2
W2
EW2
R4
R4
10 3/4"
F7
1'-2 1/4"
F2
F3
B6
SB2
VARIES
1'-3 1/4"
MAIN ROOF SYSTEM (EXPOSED MEMBRANE CONVENTIONAL, R-27.5 EFFECTIVE)
- RIVER ROCK (@ LOWER ROOF ONLY)
WRB
- 2-PLY TORCH APPLIED SBS ROOF MEMBRANE
- 1/2" PROTECTION BOARD
- 2 1/4" POLYISOCYANURATE INSULATION, (R-12.3 MIN. EFFECTIVE)
- TAPERED POLYISOCYANURATE INSULATION, SLOPED 2%, (R-15.5 MIN. EFFECTIVE)
VCL
- IMPERMEABLE SELF ADHERED MEMBRANE (VAPOUR BARRIER)
AB
- 3/4" T&G PLYWOOD GLUED AND NAILED, REFER TO STRUCTURAL. (AIR BARRIER)
- R12 BATT INSULATION
- 14" TJI 230 ROOF JOIST @ 16" O.C.
- 1/2" GYPSUM BOARD
EW1
NOOK
104
8'-10 5/16"
2
A8.5
1'-3 1/2"
1'-2 1/4"
F2
F2
SB1
1 HR FIRE SEPARATION

All the details



Implement the details

It is not feasible to draw every scenario

There are many ways to achieve an airtight home

Education provides carpenters the knowledge to understand the design intent of create an airtight home and to problem solve unusual details

Educating multiple people on the same project promotes collaboration and air barrier mindfulness at each phase of construction

Training our team has allowed us to excel

We’re hiring carpenters

Info@kingdombuilders.ca

KINGDOM BUILDERS