

STEP CODE CAFÉ: Navigating Through Together

Tuesday, February 23, 2021 | 3:00 - 5:00 pm





Wasel Ur Rahman, MSc
Senior Technical Advisor – Building Systems
City of Abbotsford



Jennifer Cotton
Executive Officer
CHBA Fraser Valley



Mark Bernhardt B.Sc. CPHC, CEA
President
Bernhardt Contracting

AGENDA

- Housekeeping items
- City of Abbotsford Updates
- Introduction and basics of Step Code
- Closing remarks

Housekeeping items

- Attendees are encouraged to use the chat option
- Session is being recorded
- Slides will be available on City of Abbotsford website
- Polling Questions
- Post-event survey

Polling questions coming up!
Go to [slido.com](https://www.slido.com) - code **50786**

COA Updates

- From October 1st 2020, the City of Abbotsford has mandated the BC Energy Step Code for new construction

COA Current Step Code Requirements

Part 9	SFDs, Garden Suites, Coach houses, Townhouses	Step 1 or higher
Part 3	Multi-family Residential, Commercial, Office, and Retail	Step 1 or higher

Polling questions coming up!
Go to slido.com - code **50786**

COA Updates

Documents for Part 9 BP submissions

<u>City's Preferred Path</u> EnerGuide Rating System : <i>Licensed Energy Advisor</i>	9.36.5 : <i>Registered Professional required</i>
<ul style="list-style-type: none"> BC Energy Compliance Report (Pre-construction form) 	<ul style="list-style-type: none"> BC Energy Compliance Report (Pre-construction form)
<ul style="list-style-type: none"> Section F must be completed 	<ul style="list-style-type: none"> Section F must be completed
<ul style="list-style-type: none"> EnerGuide Report / Home Owner Information Sheet 	<ul style="list-style-type: none"> Full House energy reports stamped with Signature and date by the Registered Professional.
<ul style="list-style-type: none"> HOT 2000 Full House energy reports for both proposed and reference buildings. 	
<ul style="list-style-type: none"> Plan drawings clearly showing all energy efficiency upgrades. 	

Polling questions coming up!
 Go to [slido.com](https://www.slido.com) - code **50786**

COA Updates

Documents for Part 3 BP Submissions

- Part 3 Energy Design Report
- Letters of Assurance (Schedule B) from Registered Professionals with BC Energy Step Code section completed.

BRITISH COLUMBIA BUILDING CODE 2018

SCHEDULE B
Forming Part of Subsection 2.2.7., Division C of the
British Columbia Building Code

Building Permit Number
(for authority having jurisdiction's use)

**ASSURANCE OF PROFESSIONAL DESIGN AND
COMMITMENT FOR FIELD REVIEW**

Notes: (i) This letter must be submitted prior to the commencement of construction activities of the components identified below. A separate letter must be submitted by each registered professional of record.
(ii) This letter is endorsed by: Architectural Institute of BC, Association of Professional Engineers and Geoscientists of the Province of BC, Building Officials' Association of BC, and Union of BC Municipalities.
(iii) In this letter the words in italics have the same meaning as in the British Columbia Building Code.

To: *The authority having jurisdiction*

Name of Jurisdiction (Print) _____

Re: _____

Name of Project (Print) _____

Address of Project (Print) _____

The undersigned hereby gives assurance that the design of the
(Initial those of the items listed below that apply to this registered professional of record. All the disciplines will not necessarily be employed on every project.)

_____ ARCHITECTURAL
_____ STRUCTURAL
_____ MECHANICAL
_____ PLUMBING
_____ FIRE SUPPRESSION SYSTEMS
_____ ELECTRICAL
_____ GEOTECHNICAL — temporary
_____ GEOTECHNICAL — permanent

(Professional's Seal and Signature) _____
Date _____

Polling questions coming up!
Go to [slido.com](https://www.slido.com) - code **50786**

COA Updates

- For BP submissions make sure you submit all necessary documents
- Consistency in Energy Advisor reports and plan drawings
- Easy to review

Polling questions coming up!
Go to [slido.com](https://www.slido.com) - code **50786**

Slido Polling Time!

Join us at
[slido.com](https://www.slido.com)

Code- **50786**



Speaker Introduction

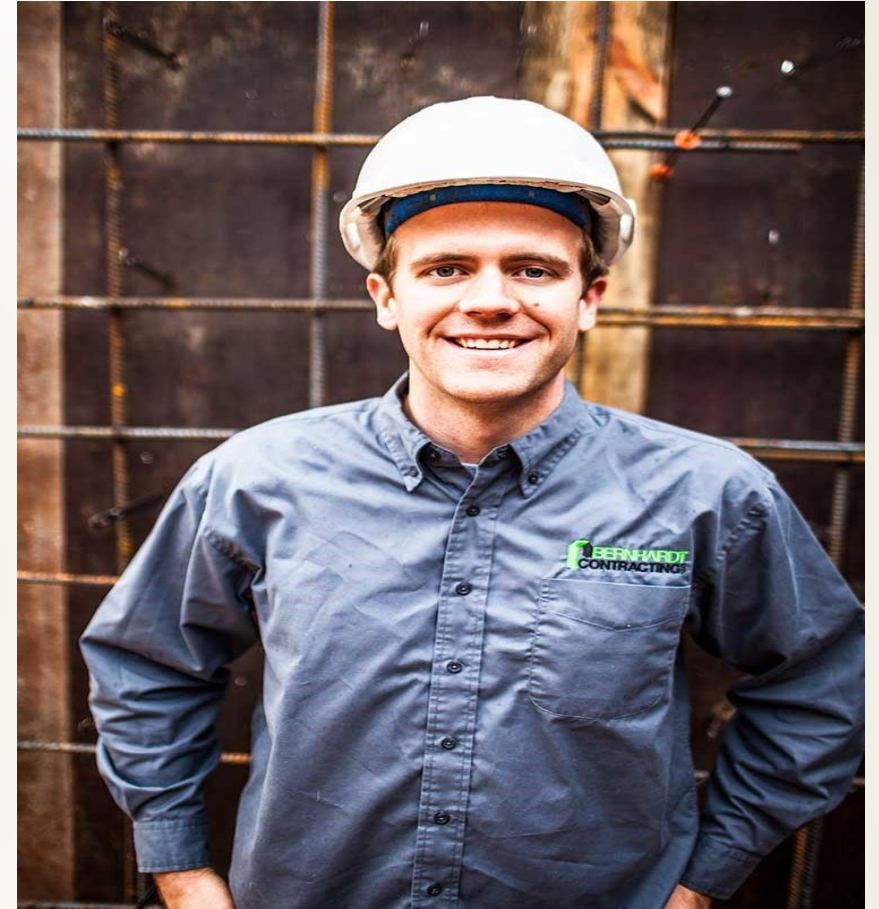
Mark Bernhardt

B.Sc. CPHC, CEA

President Bernhardt Contracting

Highlights:

- Bernhardt Contracting built the first Certified Passive house in Vancouver Island.
- Certified Energy Advisor
- Passive House Consultant
- Chairs the CHBA BC Technical Committee and serves several provincial code committees.



STEP CODE CAFE

Abbotsford

Winter 2021



1

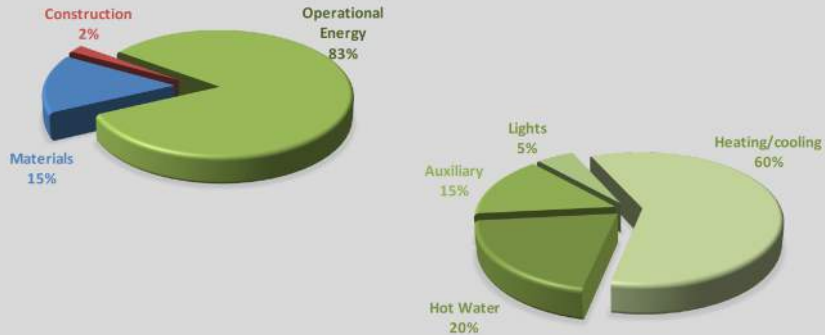
Today's Schedule

- Why we have step code
- Working with an EA
- Overview of Step Code
 - MEUI
 - TEDI
 - ACH
- Cost Effective Case Study



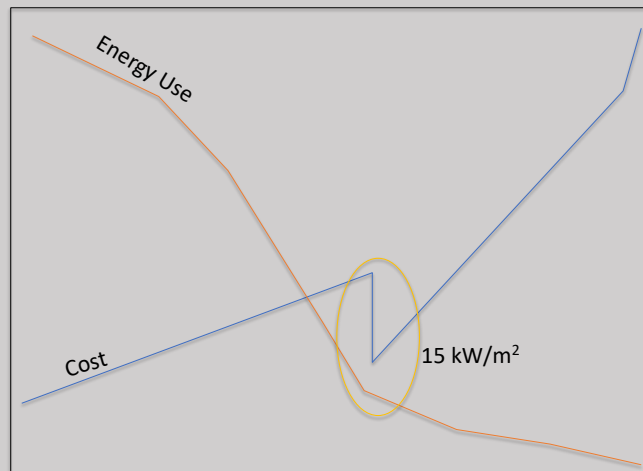
2

The Life Cycle Impact of a House



3

Why 15kW/m²?



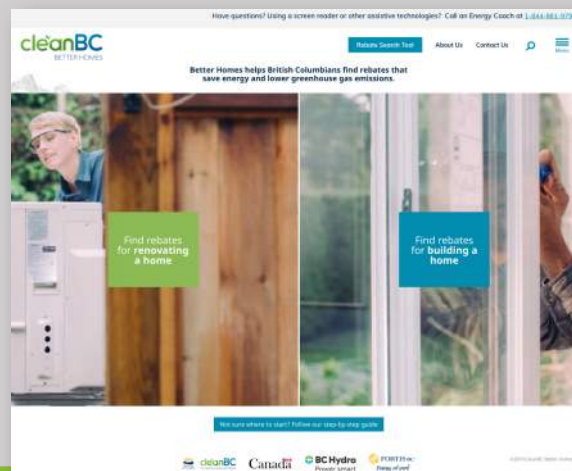
4

The Steps



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Rebates and EAs betterhomesbc.ca



6

Rebates and Incentives

All Electric

Energy Step Code Pathway

Build a home to BC Energy Step Code 3 or higher using electric space and water heating systems.

ESC Step	Rebate	Energy Advisor Support Rebate	All-Electric Bonus (optional)
Step 3	\$4,000	\$1,000 per individually modelled home or unit	
Step 4	\$6,000	<ul style="list-style-type: none"> \$800 to the builder \$200 to the Energy Advisor 	\$4,000 per home or unit
Step 5	\$10,000		

All Gas

Home performance rebate	Energy advisor support rebate	Additional rebates
Step 2 - \$3,000		<ul style="list-style-type: none"> ENERGY STAR natural gas dryer - \$100 EnerChoice® natural gas fireplace - \$500 Drain water heat recovery system - \$250 Connected Thermostats - \$100
Step 3 - \$4,000	<ul style="list-style-type: none"> \$100 paid to the energy advisor \$400 paid to the builder 	
Step 4 - \$6,000		
Step 5 - \$10,000		



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Finding an EA



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Names, Contact info, What they are qualified for

- [ERS - EnerGuide Rating System](#)
- [FBC - FortisBC New Home Program Qualified](#)
- [PHC - Passive House Certification](#)
- [BCBC EM - BCBC 9.36.5 Energy Modelling](#)
- [BC ECR - BC Energy Step Code Compliance Report](#)
- [MURBQ - Multi-Unit Residential Building Qualified](#)
- [MC BDT - Mid-Construction Blower Door Test](#)

Kamloops

Program Qualified	Company Name or Affiliation	Name	Email & Phone	Service Organization(s)	Services
✔	Total Home Solutions	Michael Gill	michael@totalhome.ca 250-575-4767	Total Home Solutions	ERS, FBC, BCBC EM, BC ECR, MC BDT
✔	DW Energy Advisors Inc	Nicky Hancock	stepcodeca@gmail.com 250-319-7192	DW Energy Advisors Inc CHBA BC HomeTech Energy Solutions Inc	ERS, FBC, BCBC EM, BC ECR, MURBQ, MC BDT
✔	Cantech Energy Advisors Ltd	Gurmukh Singh	info@cantechenergy.ca 604-908-9044	Vendatech Energy Mgmt&Consulting Inc	ERS, PHC, FBC, BC ECR, MC BDT
✔	Bernhardt Contracting Ltd	Dallas Hordchuk	energy@bernhardtcontracting.com 250-857-2432	CHBA BC	ERS, FBC, BCBC EM, BC ECR, MC BDT
✔	Bernhardt Contracting Ltd	Mark Bernhardt	energy@bernhardtcontracting.com 250-857-2432	CHBA BC	ERS, PHC, FBC, BCBC EM, BC ECR, MURBQ, MC BDT



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What you Give your EA

- Plans
- Ventilation Selection
- Heating / Cooling Selection
- Window Selection



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What Your EA will Give You Back

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Make Sure you check this area

B: BUILDING CHARACTERISTICS SUMMARY (see BCBC Cause 2.2.8.3.(2)(b) of Division C)

Details (Assembly / System Type / Fuel Type / Etc.)	Effective RSI-Value /
Exterior Walls & Floor Headers 2x6 @ 16" OC R20 Batt	R 17
Roof / Ceilings Truss with R 40 Blown Fiberglass	R 37
Foundation Walls, Headers, & Slabs R 8 full slab with Thermal break at edge Slab Is: <input type="checkbox"/> Below OR <input checked="" type="checkbox"/> Above Frost Line <input checked="" type="checkbox"/> Heated OR <input type="checkbox"/> Unheated	R 8
Floors Over Unheated Spaces NA	
Fenestration & Doors Double Glaze Vinyl, Argon filled, LoE coating FDWR: 7 %	R 3.12
Air Barrier System & Location Interior Poly	3.55 ACH
Space Conditioning (Heating & Cooling) Gas Comb, AFUE 95%	
Service Water Heating Gas Comb, AFUE 95%	
Ventilation CRV 14 L/s no heat recovery	
Other Energy Impacting Features	

Based on information provided by the builder and drawings prepared by AIB Designs

Date (YYYY/MM/DD) June 26 2019



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Other Useful Reports

Address: 1224 Kings Rd, Victoria, BC V8W 2G4 (250) 363-0800

HOMEOWNER INFORMATION SHEET ENERGUIDE

Your EnerGuide® rating and this report are based on data collected and where necessary, provided from your evaluation. Rating calculations are made using standard operating conditions.

Rating: 42 (42/100) as your rated heat loss (kJ or gWh) is 0%

Rated energy intensity: 0.75 kJ/m²/year
 Evaluated by: Mark Bernhardt
 Quality assessed by: CMRA
 File number: 1904900008
 Date collected: October 18, 2019
 Year built: 2010

NRCCan.gc.ca/myenerguide

HOW YOUR RATING IS CALCULATED:

I. Rated annual energy consumption: 42 GJ/year
 II. Minus renewable energy contribution: -0 GJ/year
 Equals your **EnerGuide rating**: 42 GJ/year

I. Your rated annual energy consumption is the total amount of energy your house would use in a year based on the EnerGuide Rating. Supports standard operating conditions. For per house, this includes 3.75 GJ of passive solar gain.

Energy Source	Rated Consumption (GJ/year)	Equivalent Units (per year)	Greenhouse Gas Emissions (kg/year)
Electricity	0	0 kWh	0.0
Natural gas	0	42 m³	0.0
Total	42		0.0

II. On-site renewable power generation systems can offset some or even all of your home's energy consumption. Renewable energy contribution can be used offensively for your rating and your greenhouse gas emissions calculations.

On-Site Renewable Energy	Estimated Contribution (GJ/year)	Equivalent Units (per year)	Other Greenhouse Gas Emissions (kg/year)
Electricity	0	0 kWh	0.0
Solar water heating	0	0	0.0
Total	0		0.0

YOUR RATED GREENHOUSE GAS EMISSIONS CALCULATION:

Total greenhouse gas emissions: 0.0 kg/year/year
 Minus emissions offset by on-site renewables: -0.0 kg/year/year
 Equals your **rated greenhouse gas emissions**: 0.0 kg/year/year

HOW YOUR RATED ENERGY IS USED:

The chart below represents the breakdown of rated annual energy consumption in your home under standard operating conditions. You can use these figures as a guide to help identify where you can lower home energy costs through proper home maintenance, efficient home operation, energy efficiency retrofits or equipment replacement.

Category	Percentage
A. Space heating	13%
B. Space cooling	0%
C. Water heating	20%
D. Ventilation	1%
E. Lights & appliances	38%
F. Other electrical	33%

WHERE YOUR HOME LOSES HEAT:

Houses lose heat through their exterior shell, or building envelope. The chart below shows which and how your home loses heat. The quality and upkeep of your home can have a major impact on the amount of energy your heating and cooling systems use annually.

Category	Percentage
A. Air Infiltration	1%
B. Mass Walls	34%
C. Exposed floors	0%
D. Windows	17%
E. Exterior doors	1%
F. Basement/Foundation	28%
G. Air Infiltration/Ventilation	13%

This Guide is an official mark of Natural Resources Canada. Refer to the glossary section for an explanation of related terms.



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EA FAQ

When to contact your EA?



How long does an EA need to do their work?

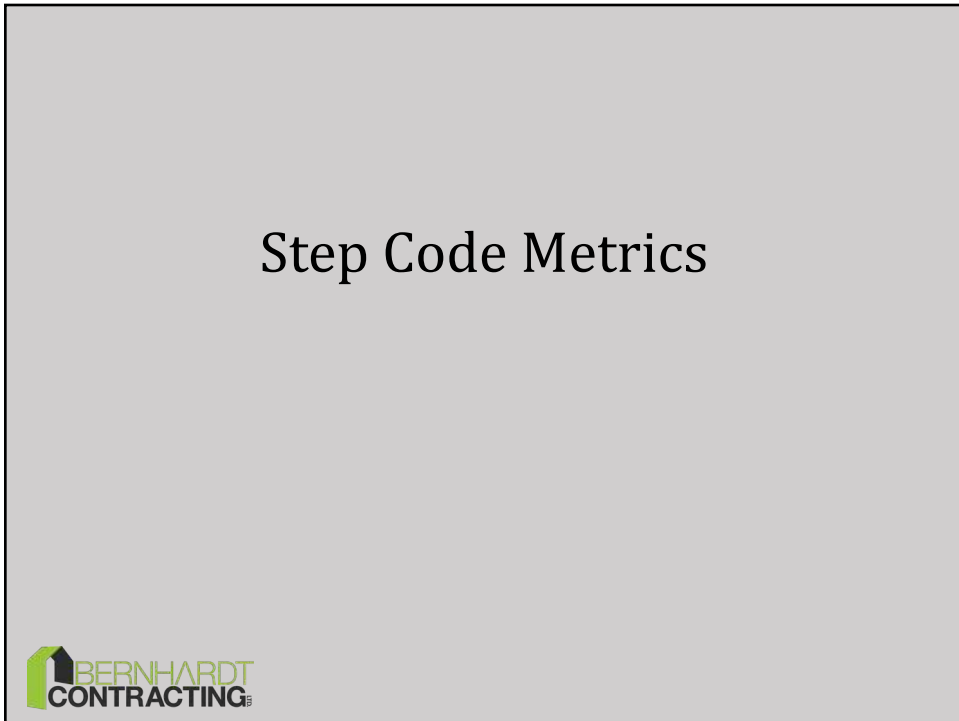
How much does it cost?



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15



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ENERGY STEP CODE BUILDING BEYOND THE STANDARD		MEUI and TEDI targets for Climate Zone 4 (Lower Mainland, Southern Vancouver Island and Sunshine Coast) Degree-Days Below 18°C Value is less than 3000									
Step	Energy Model	Airtightness		Systems and Equipment			Building Envelope				
		Blower Door Test	ACH ₅₀	%-better than ERS reference house	MEUI (kWh/m ² -year)	TEDI (kWh/m ² -year)	Adjusted TEDI (kWh/m ² -year)	%-better than ERS reference house			
1	✓	✓	Report Score	0%	Report Score	Report Score	Report Score	Report Score	Report Score		
2	✓	✓	≤ 3.0	10%	or	See below	35	or	≥ 35	or	5%
3	✓	✓	≤ 2.5	20%	or	See below	30	or	≥ 30	or	10%
4	✓	✓	≤ 1.5	40%	or	See below	20	or	≥ 20	or	20%
5	✓	✓	≤ 1.0	n/a		See below	15	or	≥ 15	or	50%

BERNHARDT CONTRACTING

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ENERGY STEP CODE BUILDING BEYOND THE STANDARD		MEUI and TEDI targets for Climate Zone 4 (Lower Mainland, Southern Vancouver Island and Sunshine Coast) Degree-Days Below 18°C Value is less than 3000									
Step	Energy Model	Airtightness		Systems and Equipment			Building Envelope				
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1	✓	✓	Report Score	0%	Report Score	Report Score	Report Score	Report Score	Report Score		
2	✓	✓	≤ 3.0	10%	or	See below	35	or	≥ 35	or	5%
3	✓	✓	≤ 2.5	20%	or	See below	30	or	≥ 30	or	10%
4	✓	✓	≤ 1.5	40%	or	See below	20	or	≥ 20	or	20%
5	✓	✓	≤ 1.0	n/a		See below	15	or	≥ 15	or	50%

BERNHARDT CONTRACTING

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Absolute Metrics

TEDI and MUEI

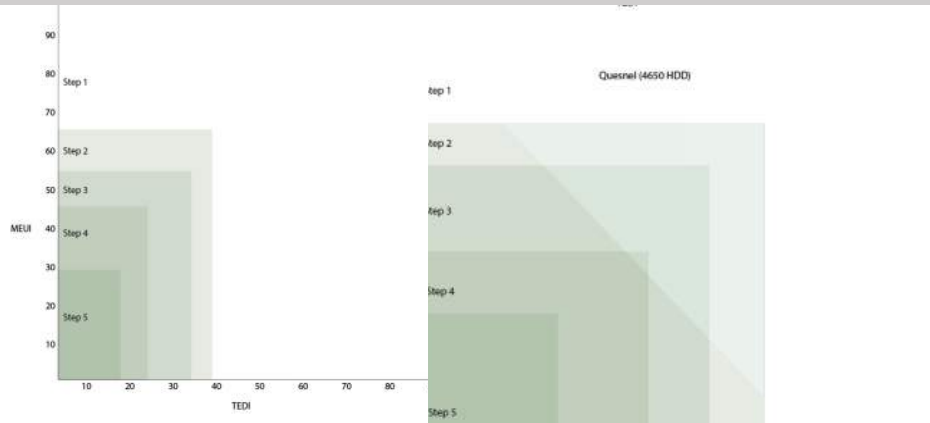


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Different Targets for different climates

Victoria

Quesnel




20



TEDI

Thermal Energy Demand Intensity

- The heat gains – the heat loss of the house per square metre of floor area













 How hard your heating system works to keep the house warm

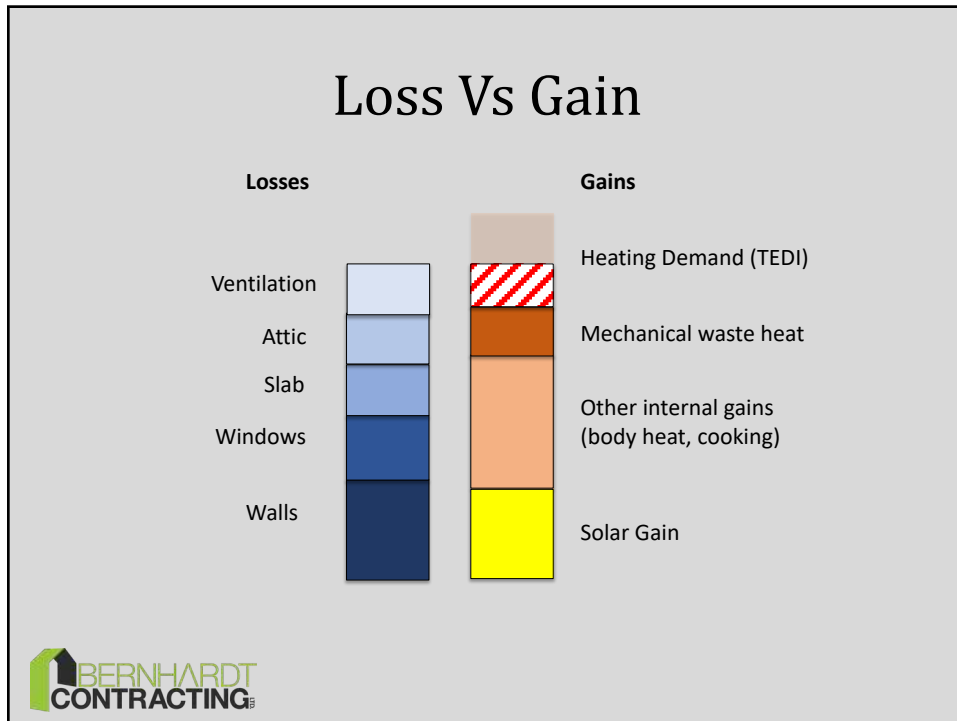
21

Loss Vs Gain

Losses		Gains
Ventilation		 Heating Demand (TEDI)
Attic		 Mechanical waste heat
Slab		 Other internal gains (body heat, cooking)
Windows		 Solar Gain
Walls		



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MEUI

Mechanical Energy Use Intensity. (total energy use – base loads)

- The total energy use of the home per square metre of floor area

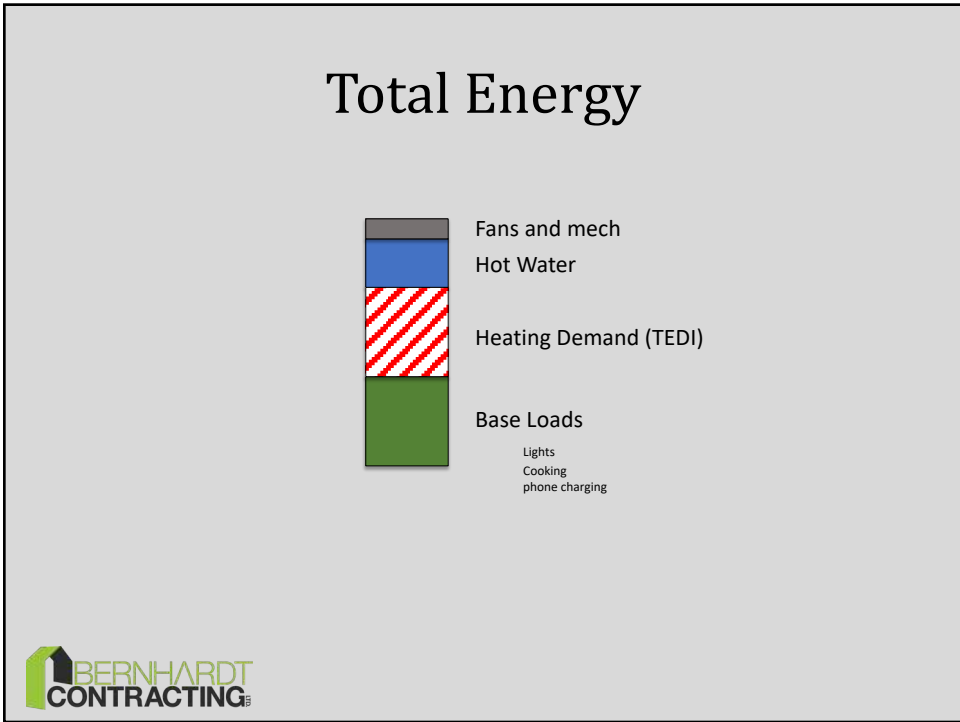
Base Loads are not included:

Appliances, plugs and lights

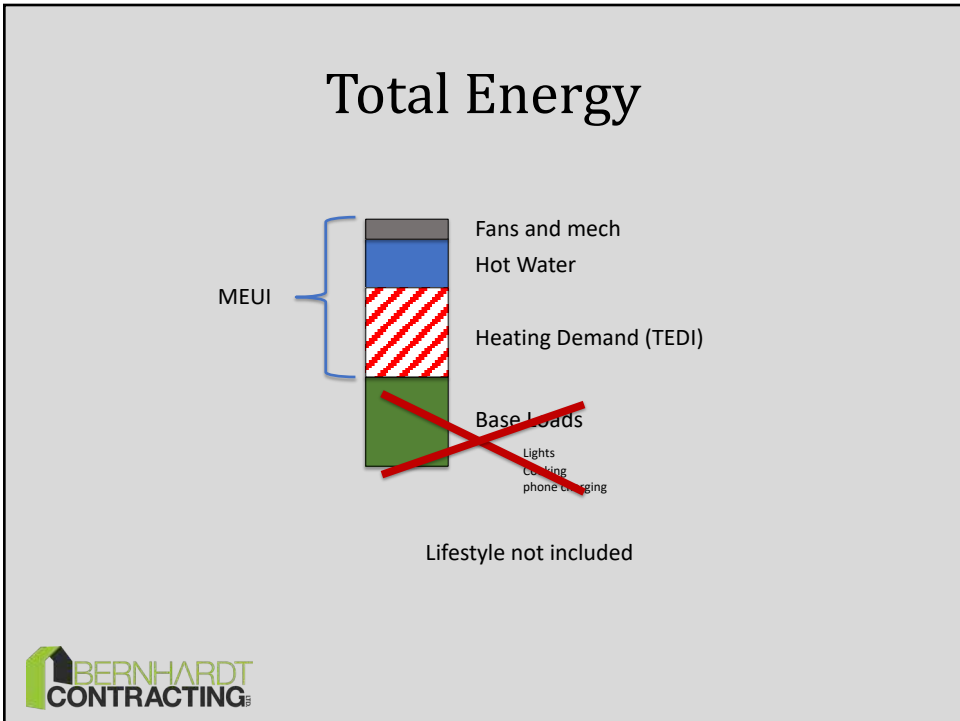


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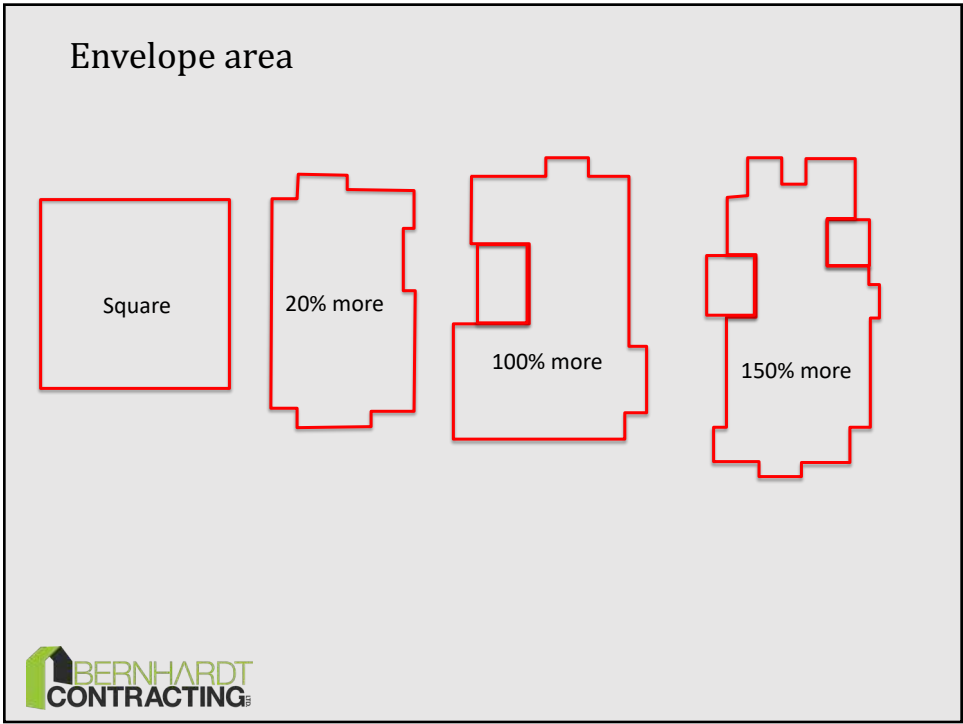
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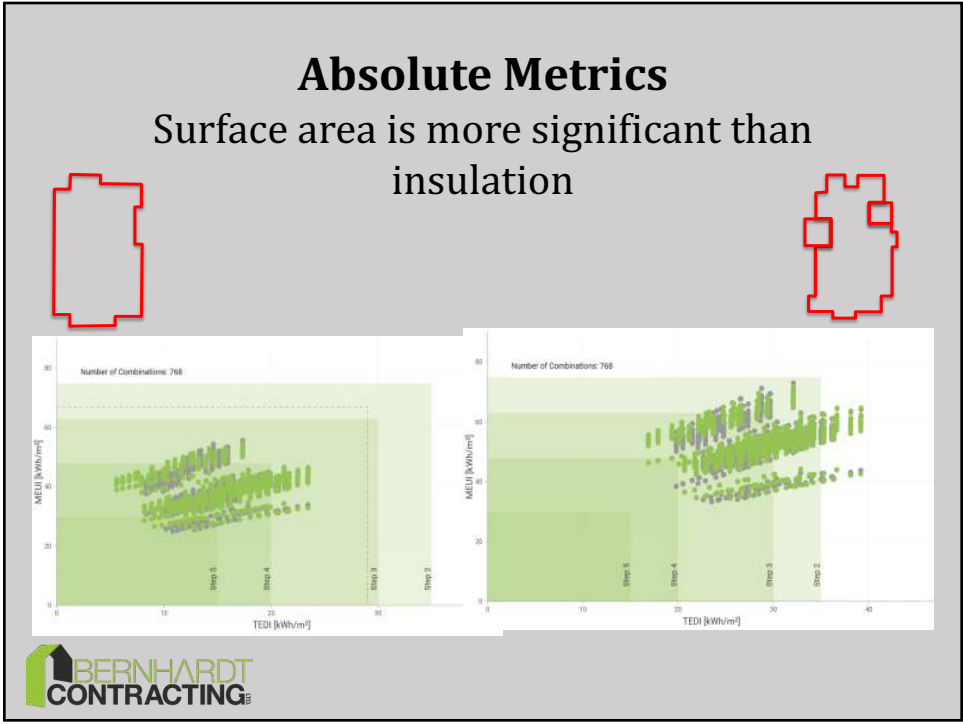
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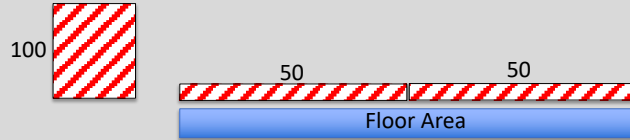
27



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Per Square Meter of Floor Area

Heating Demand (TEDI)



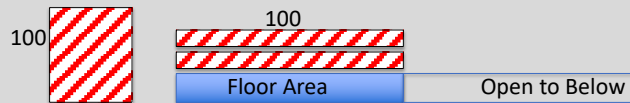
With full upper floor
Actual TEDI: 29 kWh/(m2*year)
Step Achieved: 4



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Per Square Meter of Floor Area

Heating Demand (TEDI)



With Half open loft
Actual TEDI: 35 kWh/(m2*year)
Step Achieved: 3



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32



33



34



35



36

% Better Envelope

Step 2 - 5%

Step 3 - 10%

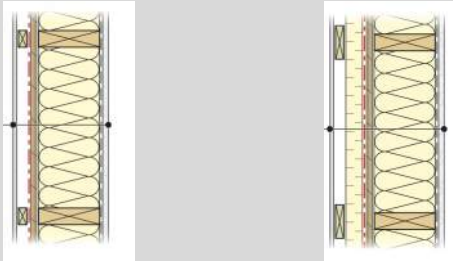
Step 4 - 20%


Step 5 - 50%

% Better Envelope

The Theory

Standard R15 effective wall + R7.5 Exterior = 50% Better





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% Better Envelope

Step 2 - 5%


Step 3 - 10%

Step 4 - 20%

Step 5 - 50%


% Better Envelope

The Practice




As Designed min code
% Better = -2.3%

Heating Load
25,842 MJ/a



Step 5 house
1.5" Exterior insulation
% Better = 51.9%


Heating Load
12,247 MJ/a



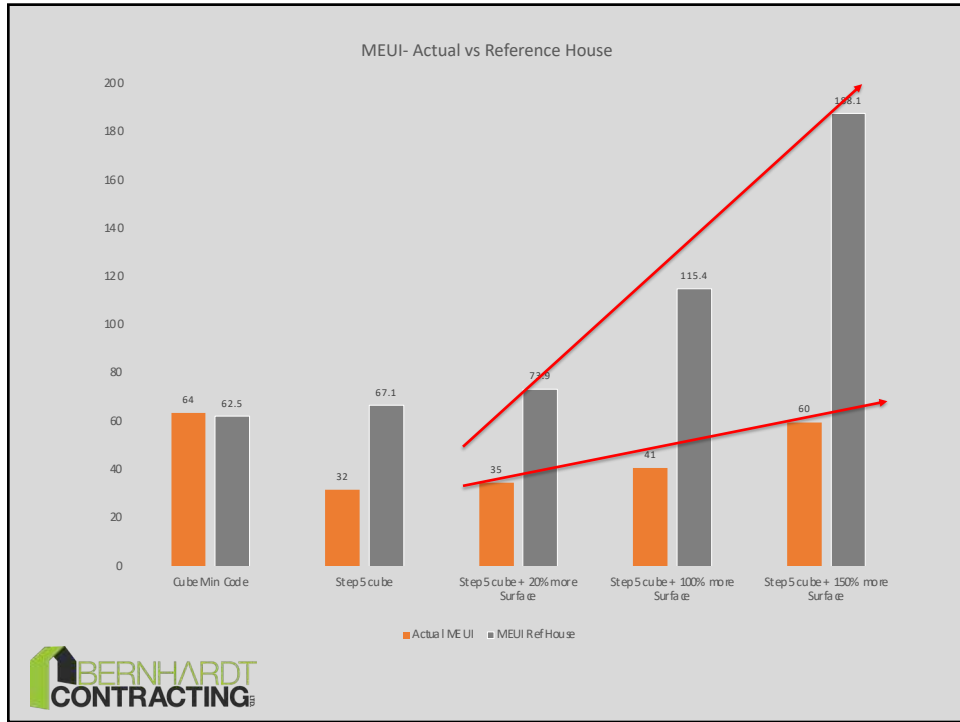
Same floor area, 50% more roof and floor
Construction as Cube
% Better = 50.3%

Heating Load
14,983 MJ/a

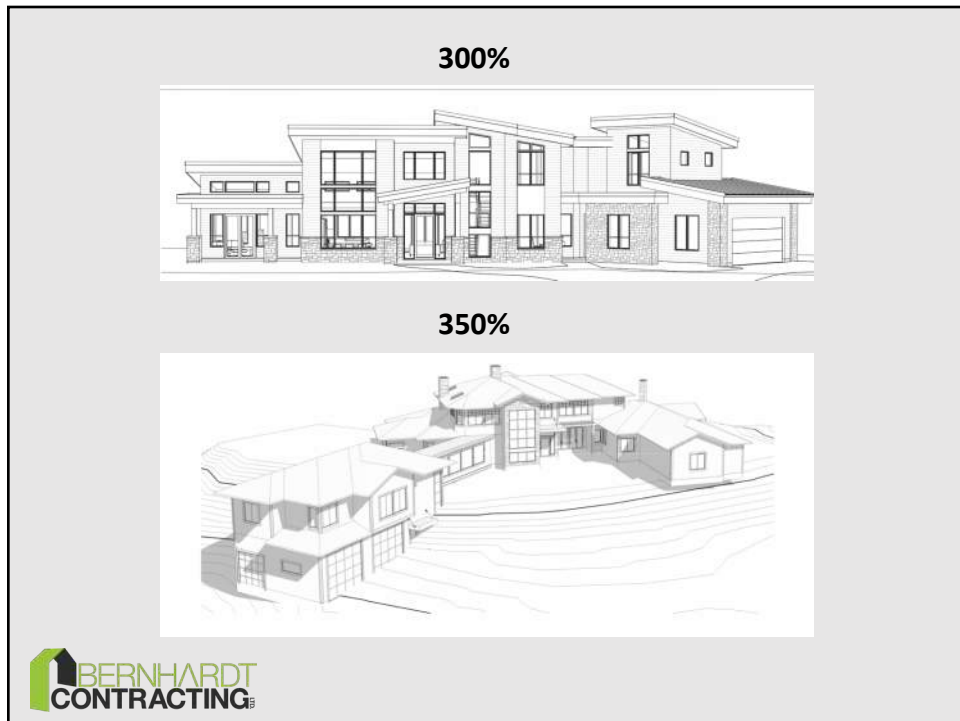
↑
22% increase in Heating Load



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40

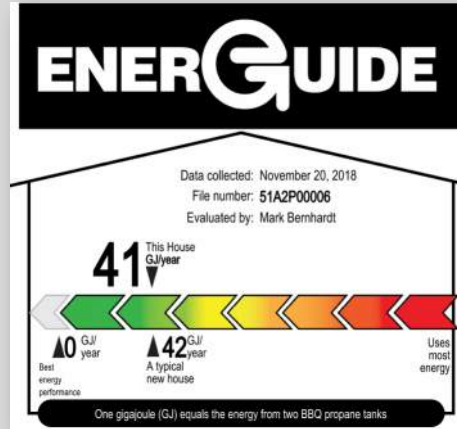
% Better than Reference

The reference house is a fairytale house with the same surface area built to minimum national code and:

Redistributed windows into single large windows with no shading

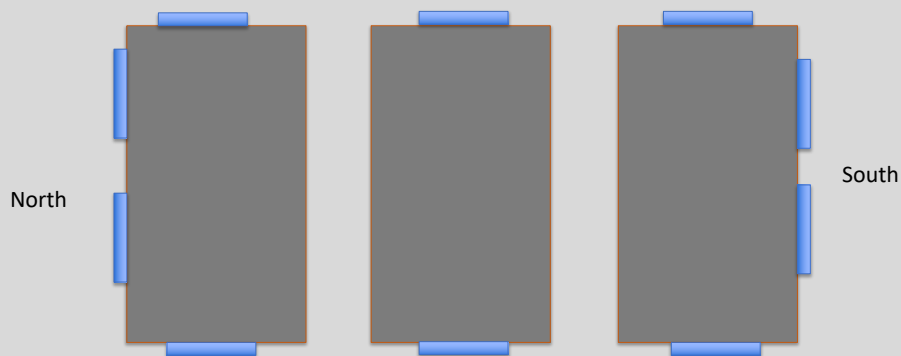
The same type of mechanical system

An assumed ACH@50 of 2.5



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Why is window placement an issue?

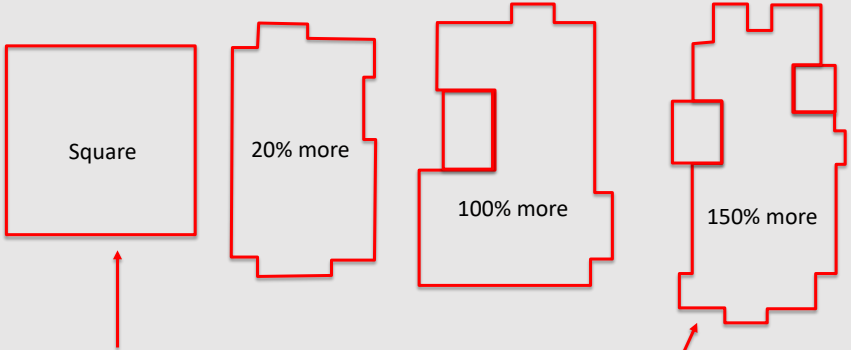


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Secrets to Success in Design




Square 20% more 100% more 150% more

For absolute Metrics build this (TEDI, MEUI and Heating Demand)

- More windows on the south
- Physics matters, for envelope and mechanical systems

For relative Metrics build this (% better overall or envelope)

- Most windows on the south
- The more surface area the better
- Physics doesn't matter
- Use gas boiler rather than furnace, or just throw a heat pump at it



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Air Leakage

AC/H @ 50Pa


1 AC/H@50 = all the air in the house leaking out once per hour when there is a pressure difference of 50 Pascals across the envelope


Key Influences

- Diligence of the install team
- Shape and Design of the building

Average on Vancouver Island is 3.5 and falling

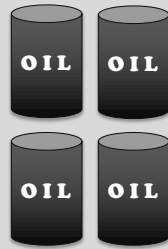
The official record is 0.16
(that we know of)

A photograph of a blower door test setup. A yellow blower door is mounted on a red table. A laptop is open on the table, displaying a software interface. A yellow device is connected to the laptop and the blower door.



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Why Does ACH Make So Much Difference?



4 ACH@ 50



1 ACH@ 50



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Secrets to Success in Construction

Supervise your trades



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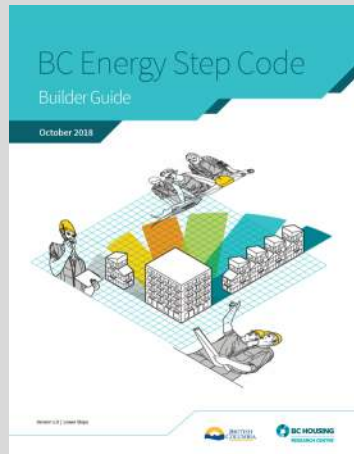
Secrets to Success in Construction

Careful Material Selection



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More Info: energystepcode.ca



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Step 5 For Free



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Adding Energy Upgrades Adds More Cost



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Using Integrated Design

Cooperation – but for Building Professionals



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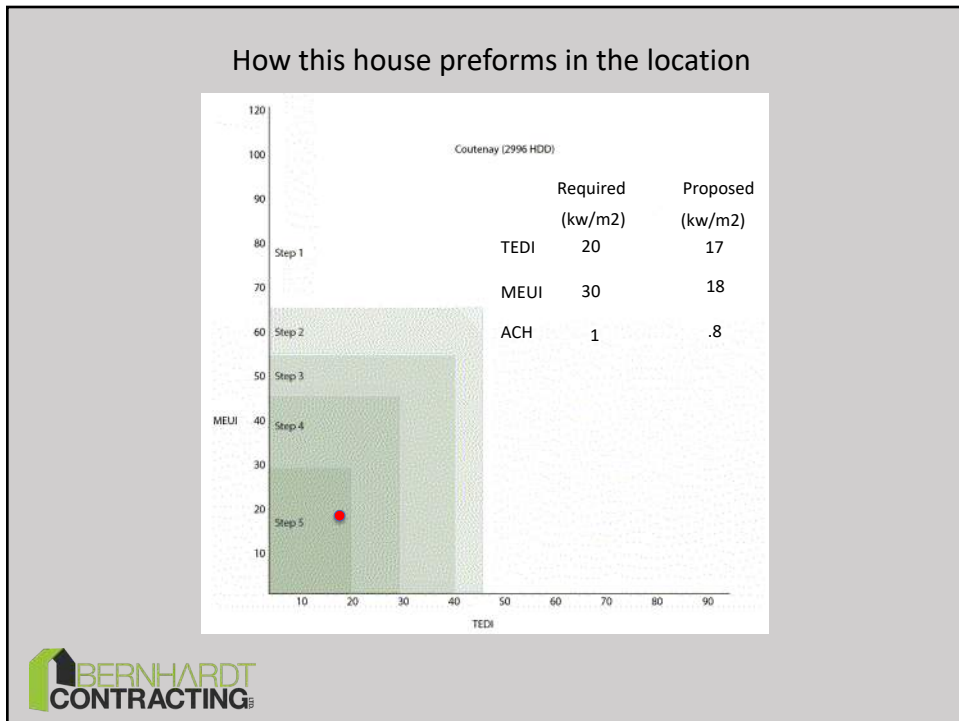
The Case study house



54



55



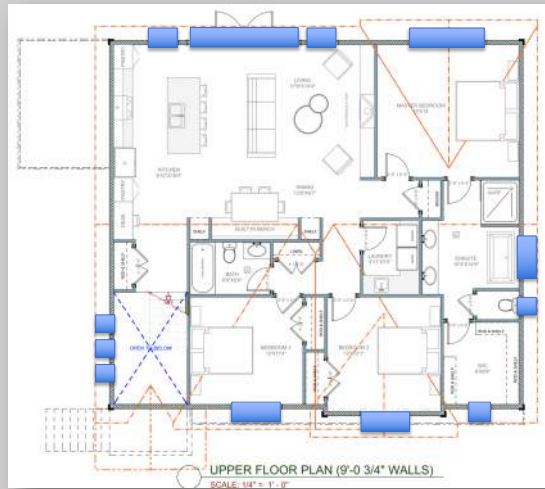
56

The shape



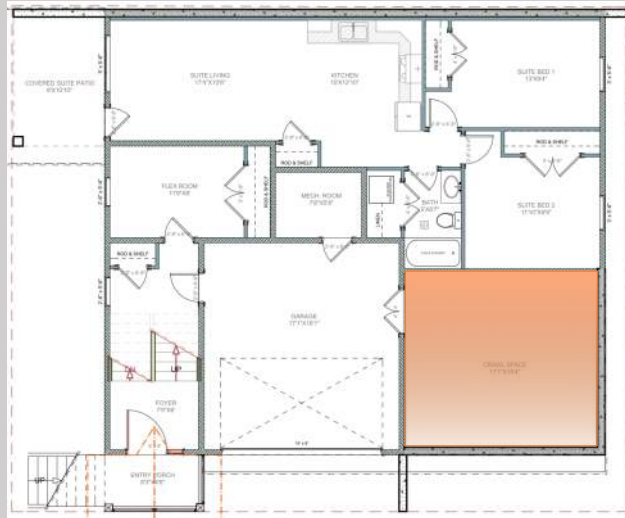
57

Windows



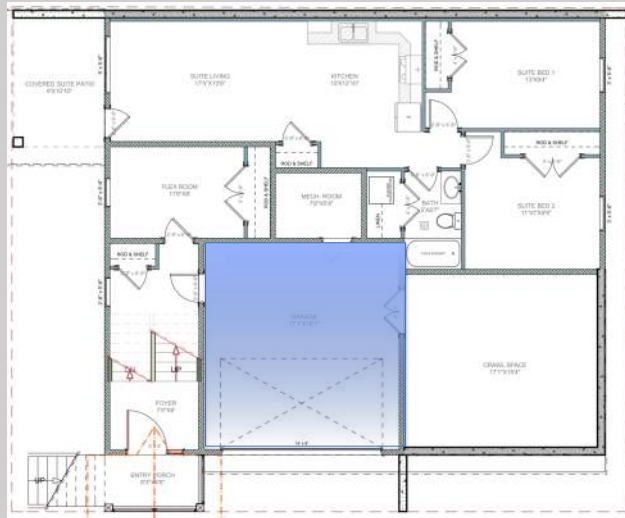
58

Basement and crawl

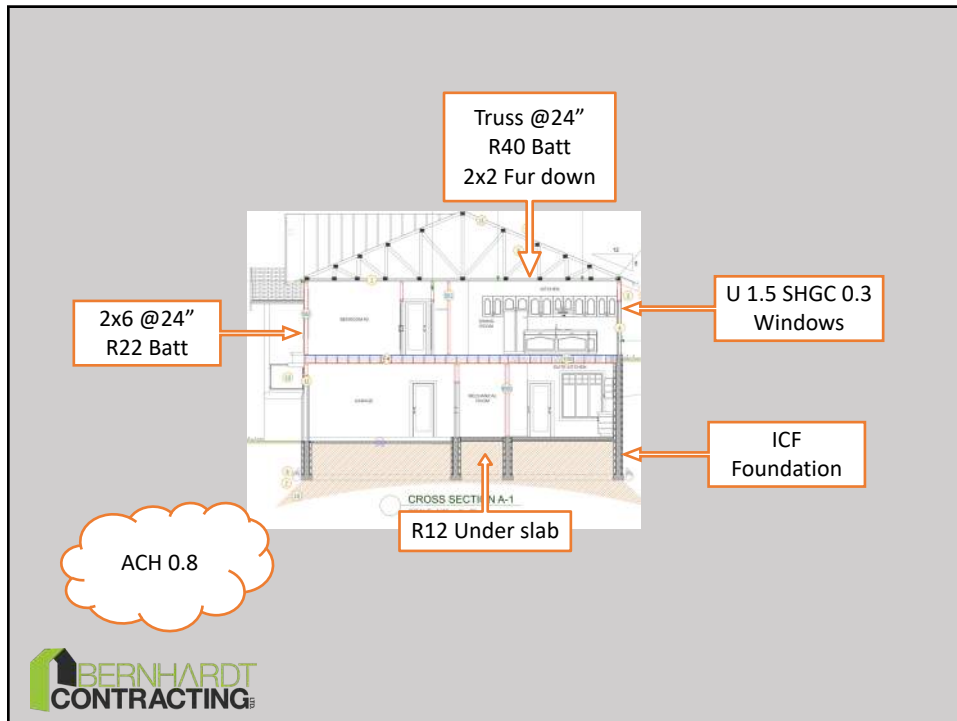


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Basement and crawl



60



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Build Cost


What in this house is different from what you build already?



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Build Cost

Version 1



Perimeter = 174

Version 3




UPPER FLOOR PLAN (9'-0" 3/4" WALLS)
SCALE 1/8" = 1'-0"

Perimeter = 160

VS

$14 \times 9 \text{ ft floor Hight} \times 2 \text{ floors} = 252 \text{ sqft less envelope}$




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Build Cost

$14 \times 9 \text{ ft walls} \times 2 \text{ floors} = 252 \text{ sqft less envelope}$

Our standard envelope costs range from \$50-70 / sqft

= \$12,600 to \$17,640 in savings



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Mechanical Systems

Last thing addressed in the design.

Designed for the house not picked based on preferences or rules of thumb



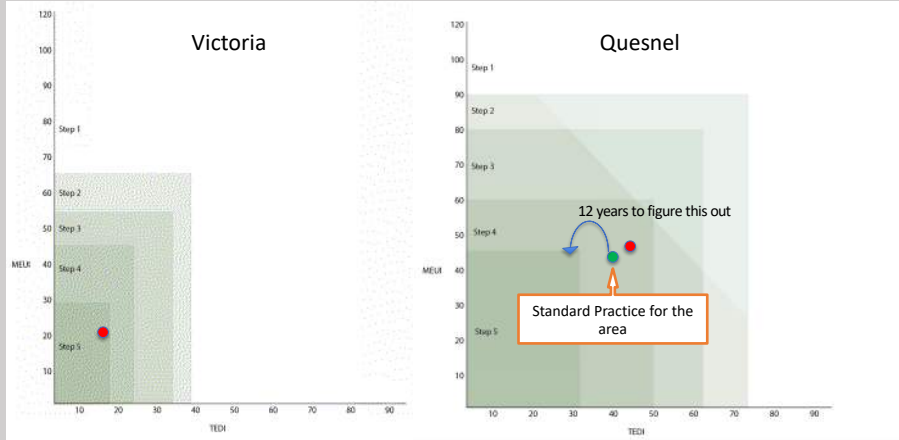
65

Sizing Mechanical Systems



66

Will it work in other areas?



67

Q & A

12:30



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Credits



- **BC Housing CPD** – Proof of attendance will be emailed to you. Your registration/sign-in today acts as the proof.
- **AIBC** – Attendee list will be sent to AIBC directly

Acknowledgments

- Mark Bernhardt, Bernhardt Contracting
- Event Sponsors
- COA and CHBA Staff
- **YOU, the audience!**

Let us know!
stepcode@abbotsford.ca

Event sponsors:



Thank You!

stepcode@abbotsford.ca

