“I Gotta Insulate What?”

Energy Code Compliance for Minimally Conditioned Buildings

PNWS-AWWA Water 2022
Tacoma, WA
April 27-29

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STRONGWORK
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Overview

Goals

- Energy Code refresher
- Define conditioned space
- Takeaways for design

Sandbox

- Thermal envelope only
- “Unoccupied” buildings only
- New buildings

Agenda

- Why Energy Code?
- What is the Energy Code?
- Conditioned or not?
- Compliance paths
- Best practices
- Take aways
- Q&A

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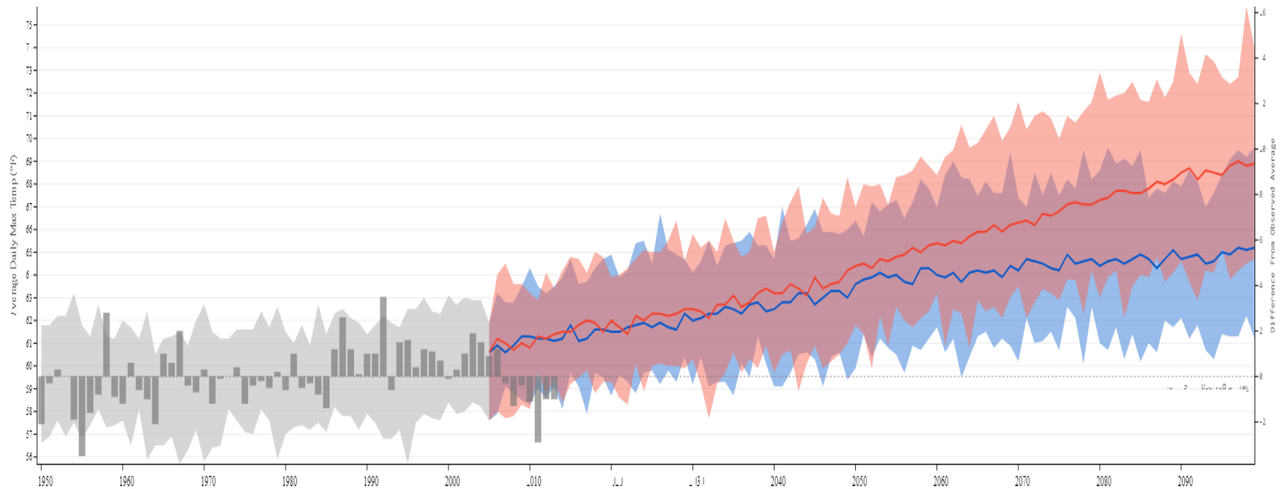
Background

Why Energy Code?

- Climate Change
  - IPCC data
- Buildings use 40% of energy
- Operator comfort
- Equipment longevity
- Reduced operational costs



Projected average daily max temp change relative to recorded historic average – crt-climate-explorer.nemac.org

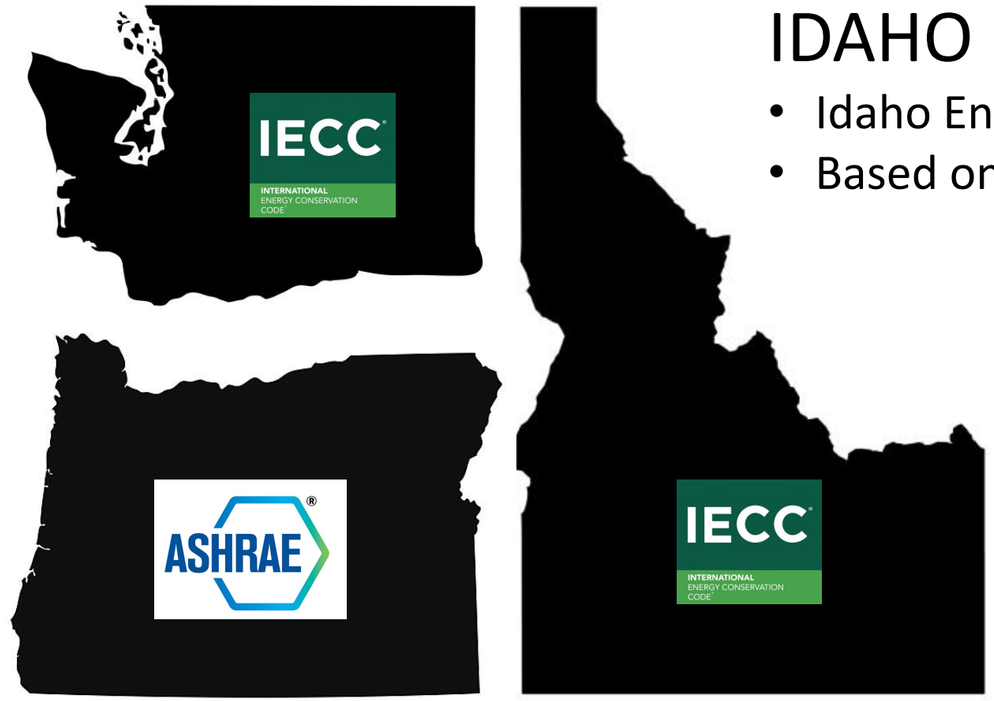
Background

What is the Energy Code?

- Standards
- Subset of Building Codes
- Locally amended code based on either IECC or ASHRAE

WASHINGTON

- 2018 WA State Energy Code (WAC 51-11C),
- Based on 2018 IECC
- Near future: 2021 WSEC, based on 2021 IECC
- Seattle has separate code also based on 2018 IECC
- TSPR



IDAHO

- Idaho Energy Code
- Based on 2018 IECC

OREGON

- 2021 OEESC
- Based on ASHRAE 90.1-2019
- COM-CHECK

Didn’t there used to be a provision for semi-heated buildings that let me get away with not insulating my pump station?

Space Classification	Washington/Idaho	Oregon
Unconditioned	Space ≠ Any of below	Space ≠ Any of below
Low Energy	PDOC* < 3.4	N/A
Semi-heated	3.4 ≤ PDOC < 8	3.4 ≤ PDOC
Conditioned	PDOC > 8	PDOC > 8**

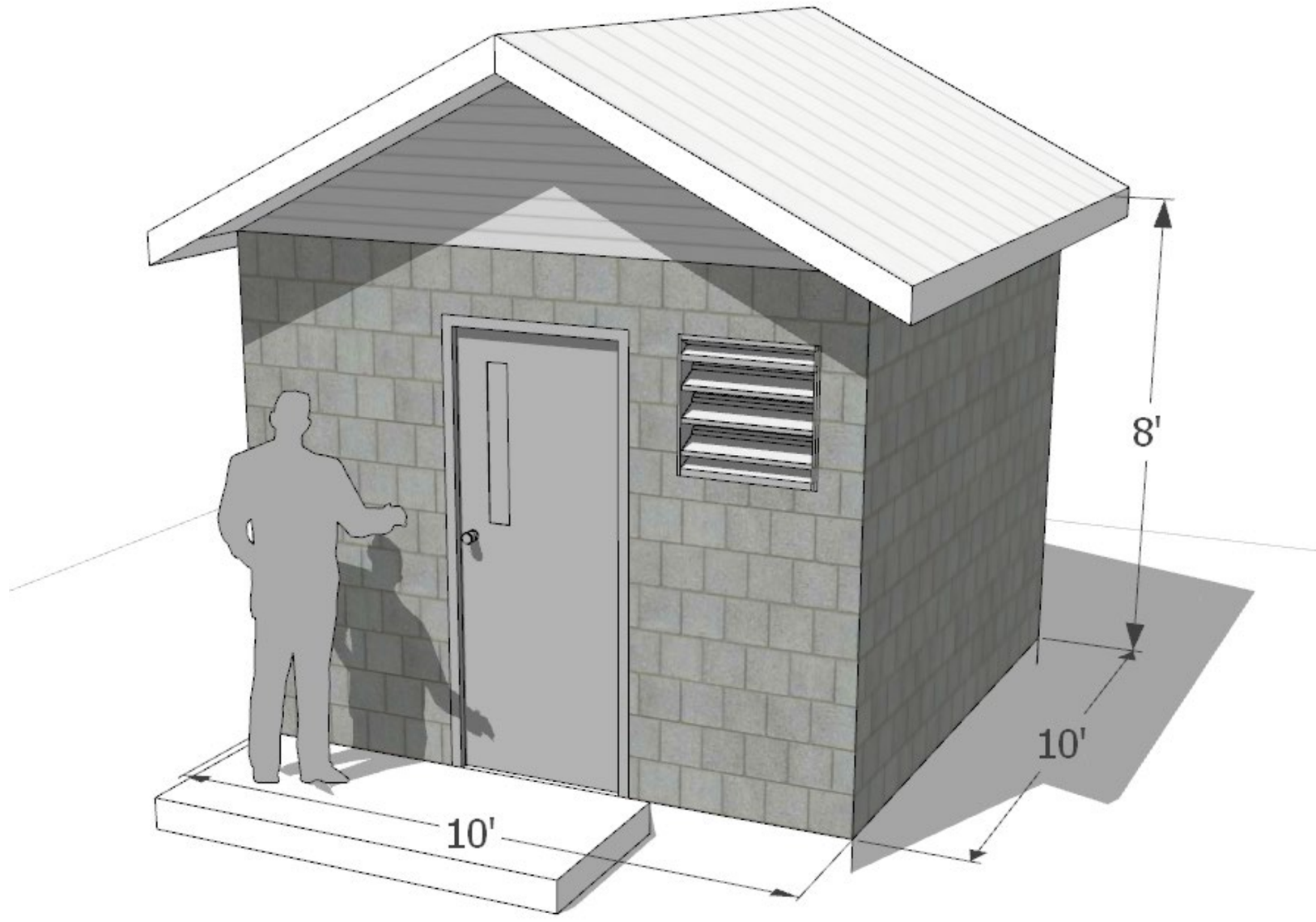
*PDOC = Peak Design Output Capacity (in Btu/h x sf)
**For climate zone 4C, minimum threshold varies per Climate Zone (Zone 5 is 12)

How do I know if my building is unconditioned, low energy, semi-heated, or conditioned?

Case Study

Parameters…

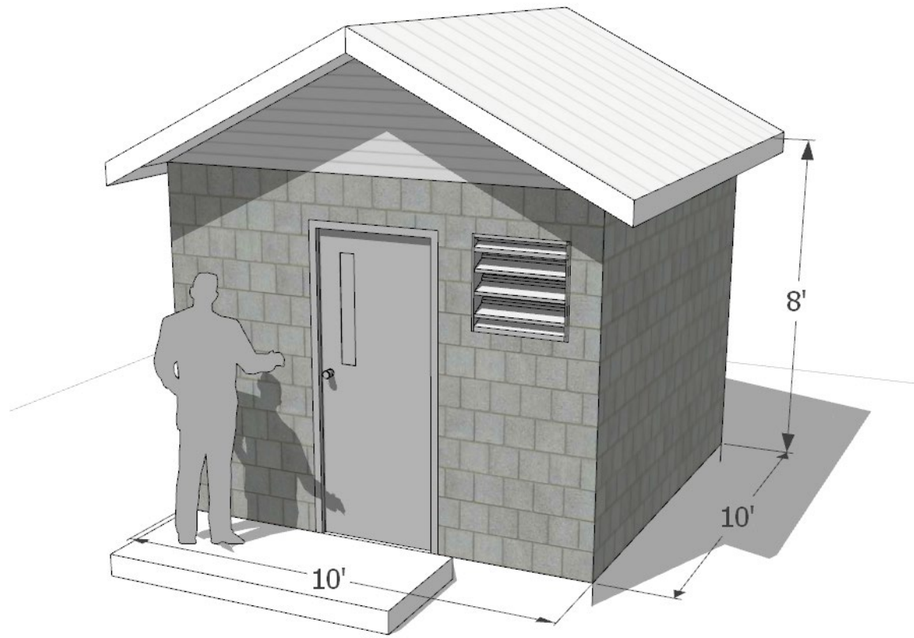
- 10x10x8 CMU Building
- Slab on grade
- Pitched truss standing seam metal roof
- Minimally heated



Case Study

In order to classify as Semi-heated…

Building Size (ft)	Area (sf)	Max PDOC (Btu/hr)
10x10	100	800



Parameters…

Symbol	Item	Quantity
OT	Outside Temp	24 F
IT	Indoor Design Temp	50 F
RA	Roof Area	100 sf
WA	Wall Area	320 sf
FA	Floor Area	100 sf
RU	Roof U Value (~2” foam)	.09
WU	Wall U-Value (CMU)	.4

PDOC Calculation:

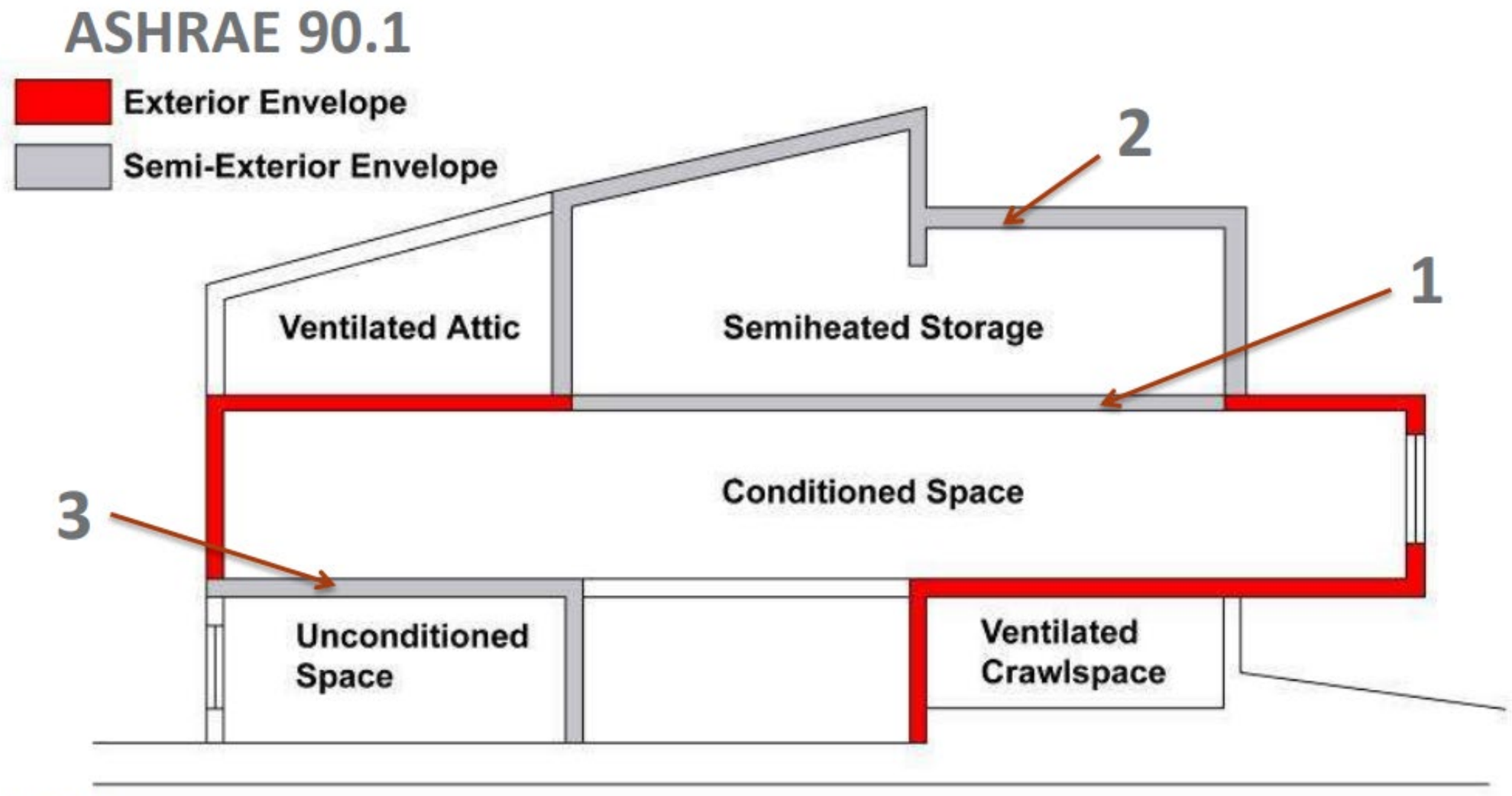
((RA x RU)+(WA x WU)) x (IT-OT)

= 3[illegible]9 Btu/hr > 800 Btu/hr

Not semi-heated

Conditioned

So where would I find a semi-heated space?



Building Section

IECC

- Semi-heated = Conditioned
- Item 1 is NOT part of the building thermal envelope
- Items 2 and 3 ARE part of the building thermal exterior envelope

Okay….I think I know the conditioning classification of my building, what does that mean for my thermal envelope?

Space Classification	Washington/Idaho	Oregon
Unconditioned	None	None*
Low Energy	Exempt	N/A
Semi-heated	Modified	Reduced
Conditioned	Full	Full

*Oregon has added a provision that states that the Building Official has final say over whether a building should be considered conditioned or unconditioned.

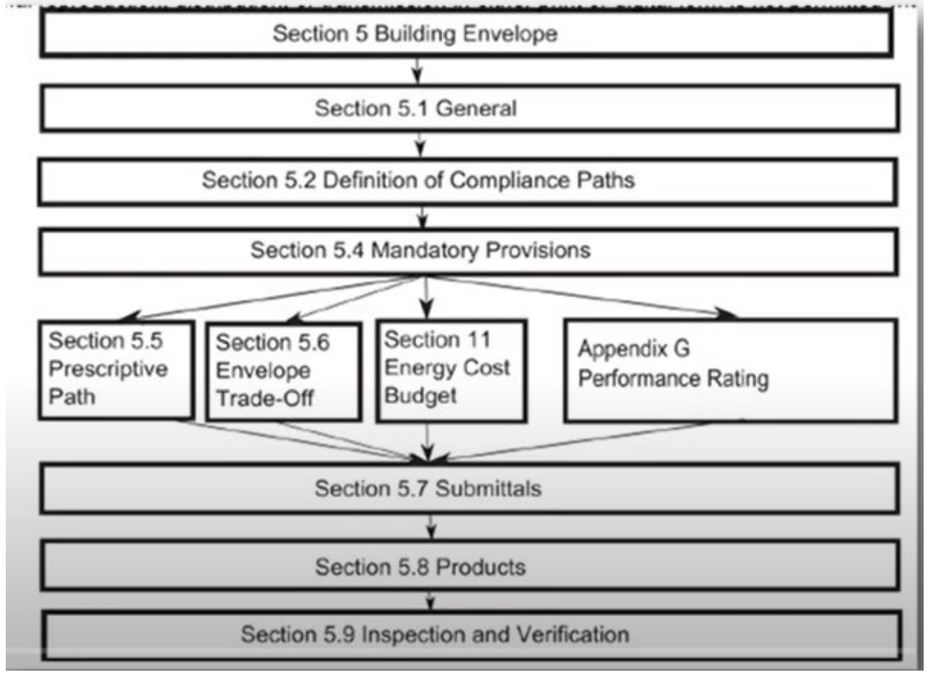
Side note: In WA and ID, “Equipment Buildings” are exempt from thermal envelope provisions:

- 500sf or less
- Include electronic equipment 7W/sf minimum
- Not occupied
- Mech systems limited
- Thermostat restricted to 50 deg F MAX
- Wall and roof U-factor less than 0.2 (R-5-ish)

Compliance Paths

Washington/Idaho

- Component R-Value Method (Prescriptive)
- Assembly U-Factor (Trade-off)
- Component Performance Alt



Oregon

- Mandatory req's
- Prescriptive
- Envelope Trade-Off
- Energy Cost Budget
- Performance Rating

Mandatory Req's include…

- Continuous Air Barrier
  - Semi-heated spaces are exempt
  - Whole Building Air Leakage
    - Testing (there are exceptions)
- Vestibule
  - There are exceptions for smaller buildings

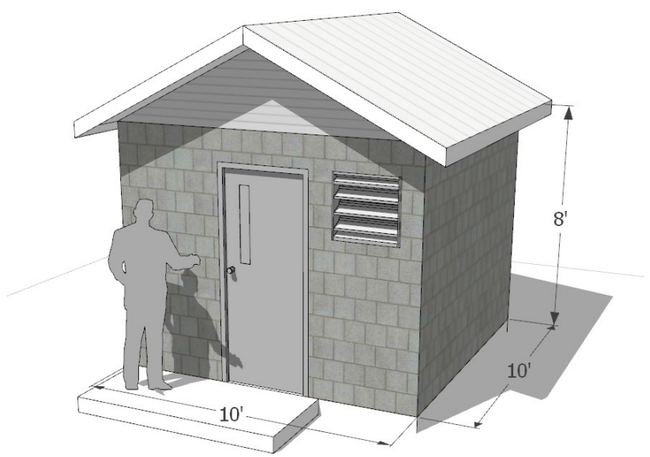
Compliance Paths

Prescriptive

OR

Element	Conditioned	Semi-heated
Roof	R-30 c.i.	R-10 c.i
Mass Walls	R-9.5 c.i.	NR
Framed Walls	R-13 + R-3.8 c.i. or R-20	R-13
Floor	R-14.6 c.i.	R-6.3 c.i.

[1] NR if all cells filled and min 50% of cells filled with insulation



Compliance Paths

Prescriptive - Oregon

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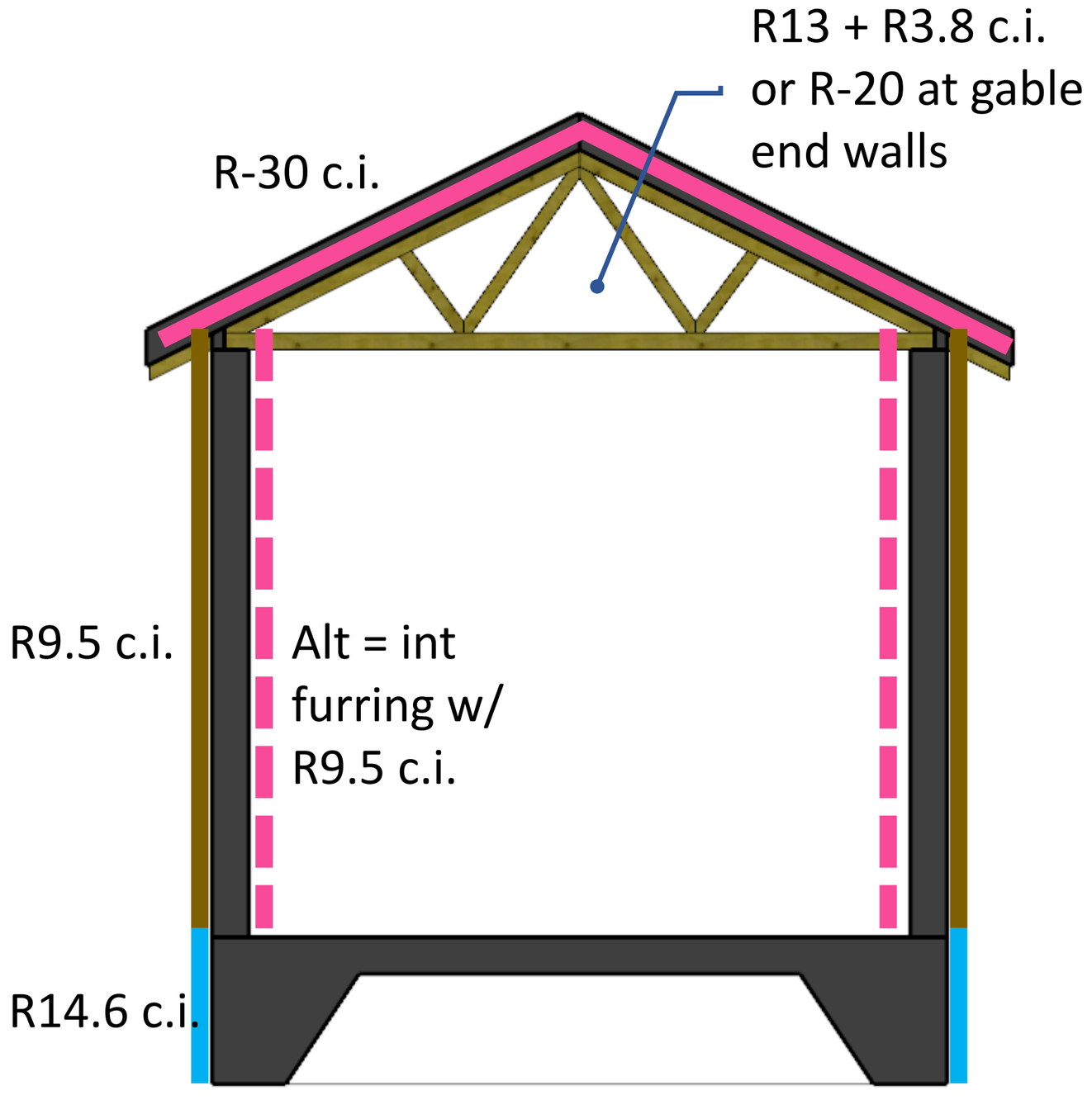

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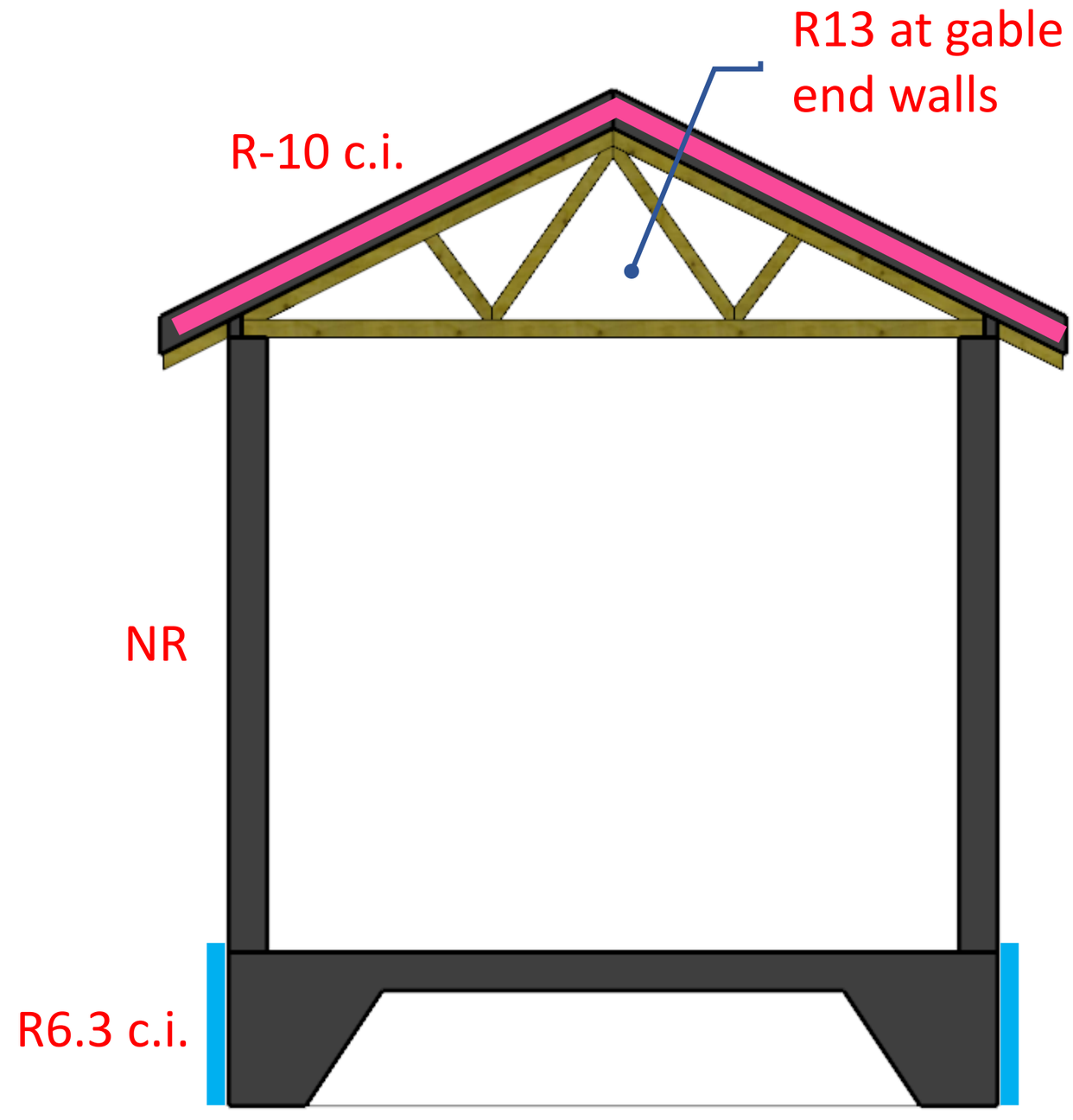


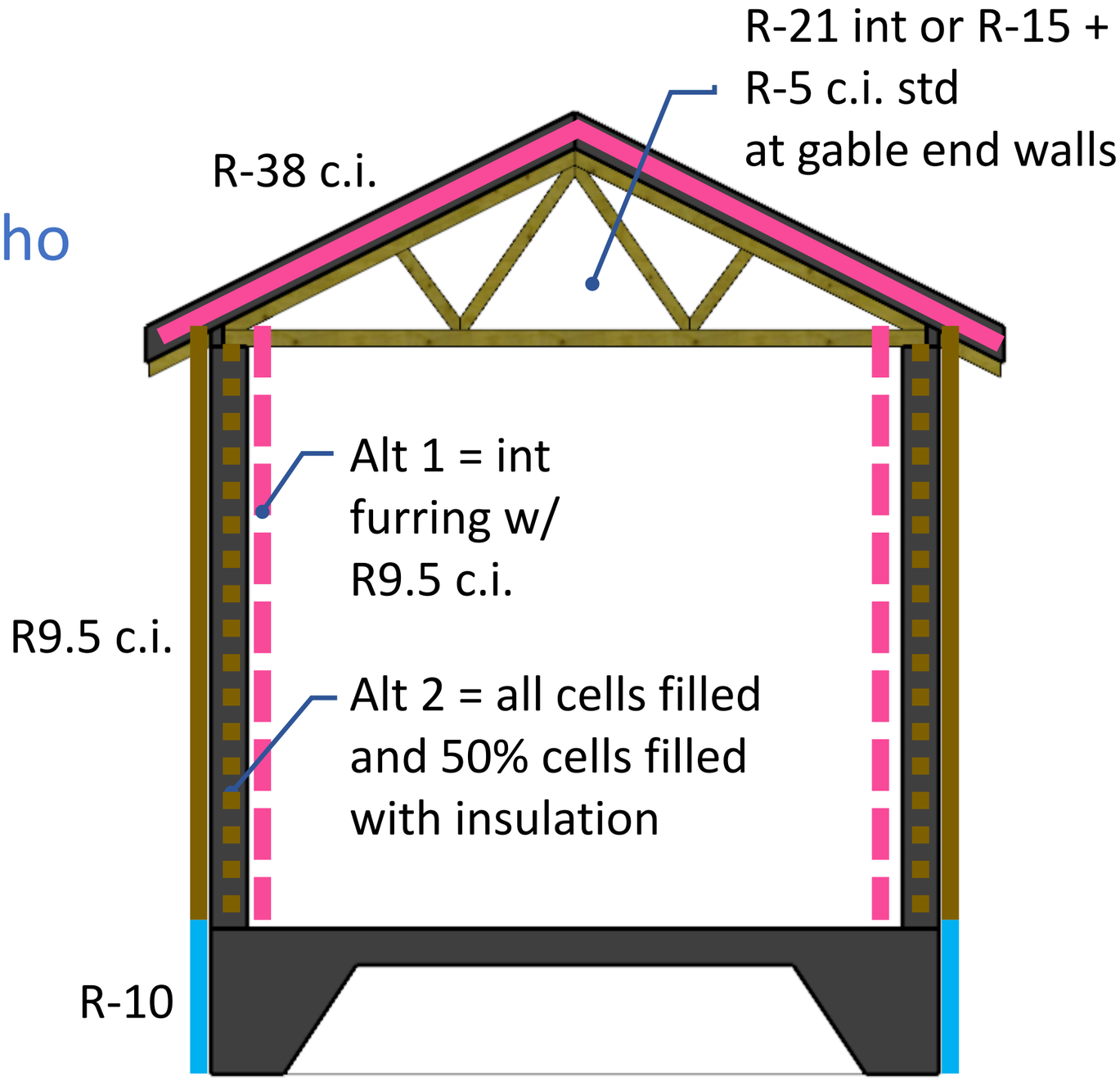
Compliance Paths

Prescriptive – Washington/Idaho

Element	Conditioned	Semi-heated
Roof	R-38 c.i.	No change
Mass Walls	R-9.5 c.i.[1]	R-9.5 c.i.[1,2]
Framed Walls	R-21 int or R-15 + R-5 c.i. std	R-21 int or R-15 + R-5 c.i. std[2]
Floor	R-10 for 24”	No change

[1] NR if all cells filled and min 50% of cells filled with insulation

[2] NR if semi-heated space, non-elec mech heating, separating semi-heated Spaces from exterior or low-energy spaces



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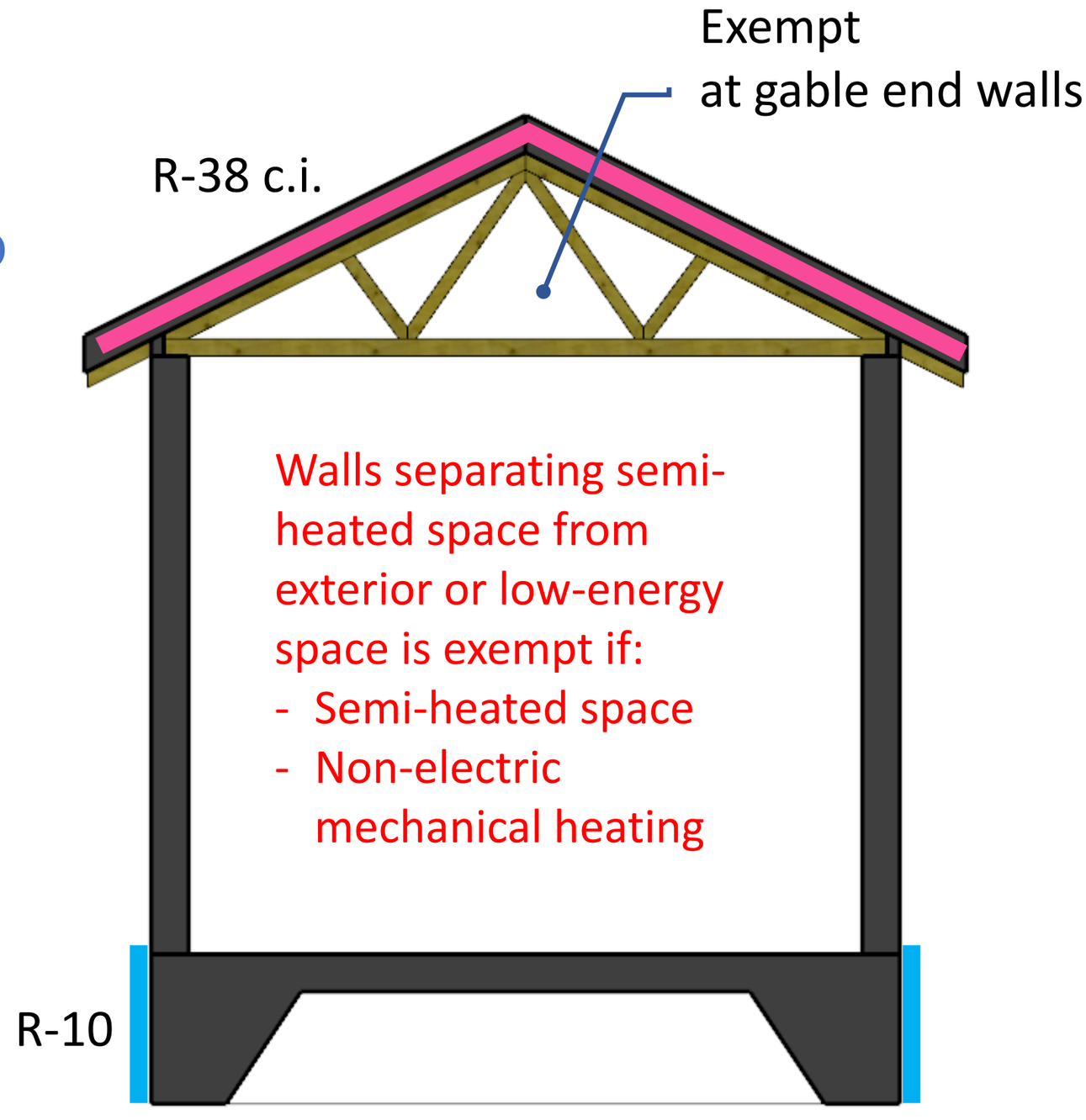

Compliance Paths

Trade-Off

- Oregon COM-Check

Assembly	Conditioned	Semi-	COM-CHECK
Roof	R-30 c.i.	R-10 c.i	R-18 c.i.
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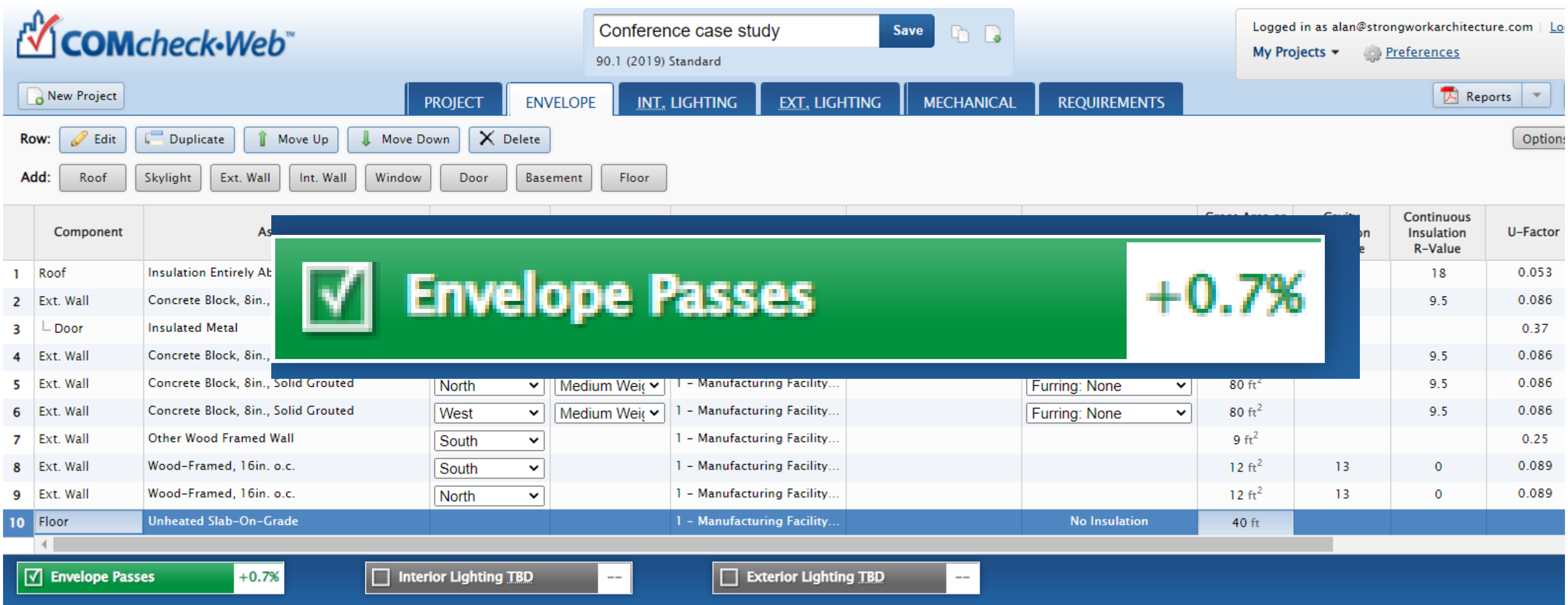
Framed Walls	R-13 + R-3.8 c.i. or R-20	R-13	R-13
Floor	R-14.6 c.i.	R-6.3 c.i.	None



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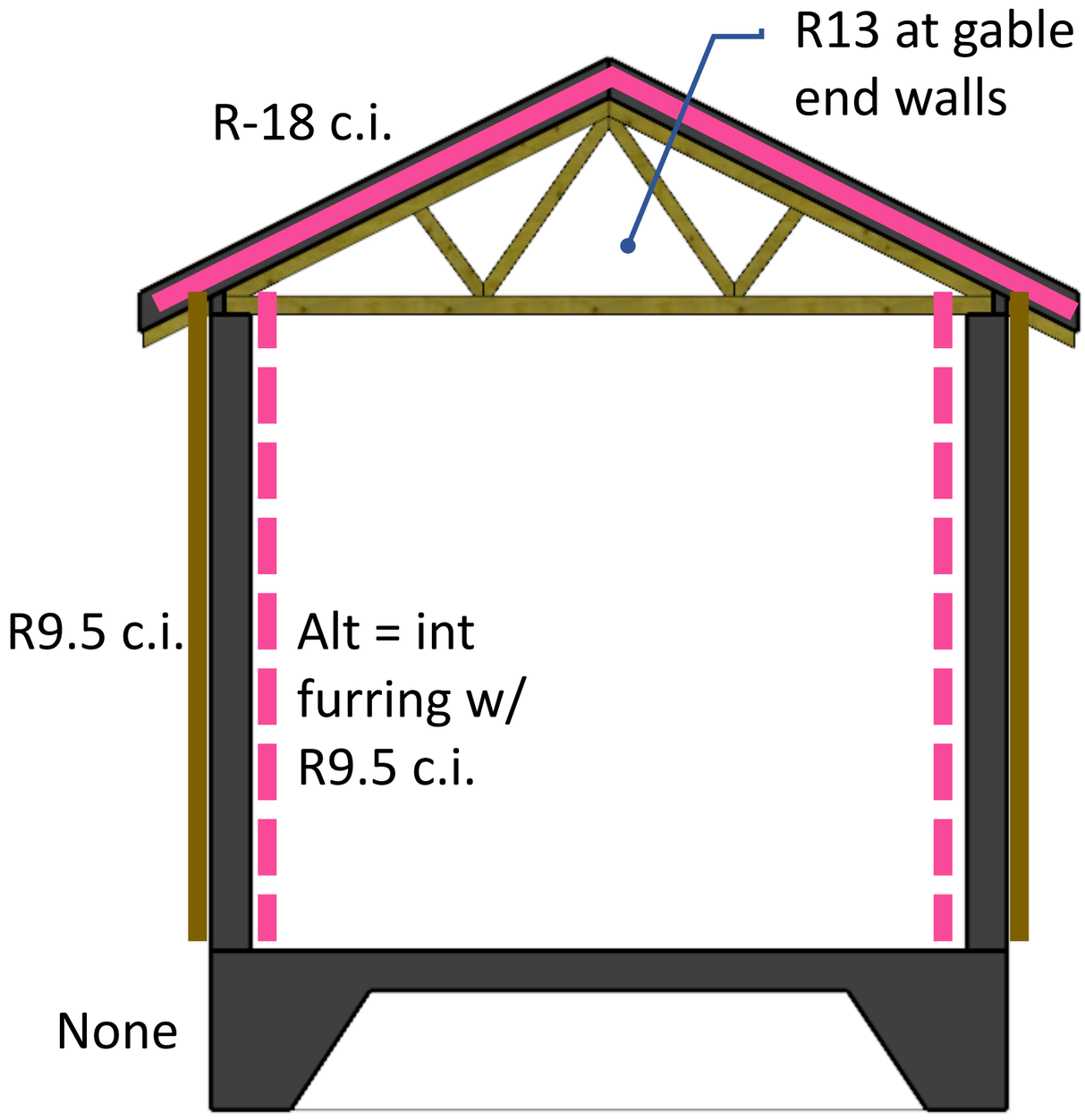


In Practice

R-30 c.i.

Green Building Advisor

R13 + R3.8 c.i.
or R-20 at gable
end walls

Florida Energy Solutions

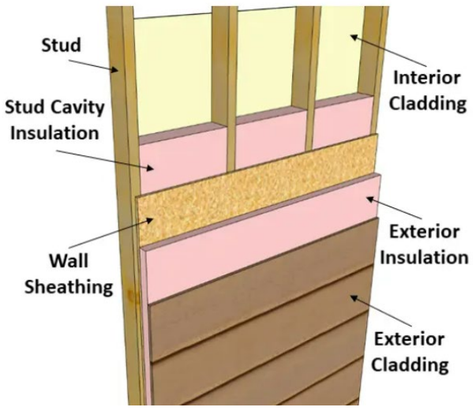
National Masonry System Guide

R9.5 c.i.

R14.6 c.i.

Washington State Energy Program 2016

Typical Wall Cross Section



Builderscalculator.com

Wrap Up

Takeaways

- Insulate the building! It’s the right thing to do
  - For the environment
  - For our clients
  - For the operators
  - For the taxpayers
  - For the end users
- Assume conditioned
- When in doubt, call the Building Official

Best Practices

- Holistic approach
- Slab edge insulation
- Continuous insulation
- Continuous Air barrier
- High efficiency electric equipment

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