"I Gotta Insulate What?"

Energy Code Compliance for Minimally Conditioned Buildings

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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

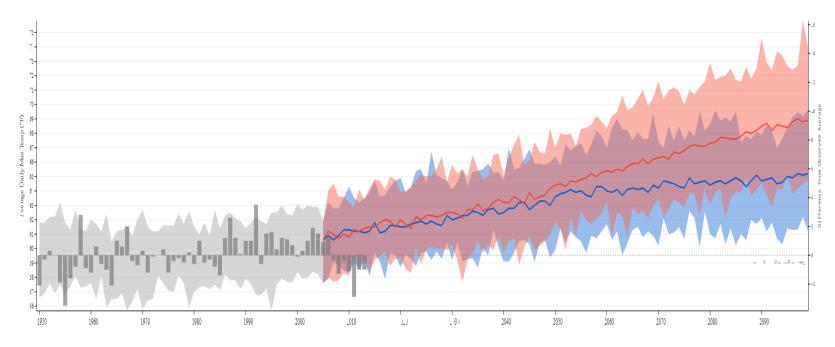




Background

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



OREGON

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

IDAHO

- Idaho Energy Code
- Based on 2018 IECC

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
Low Energy	PDOC* < 3.4	N/A
Semi-heated	$3.4 \le PDOC < 8$	$3.4 \leq PDO$
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?

below

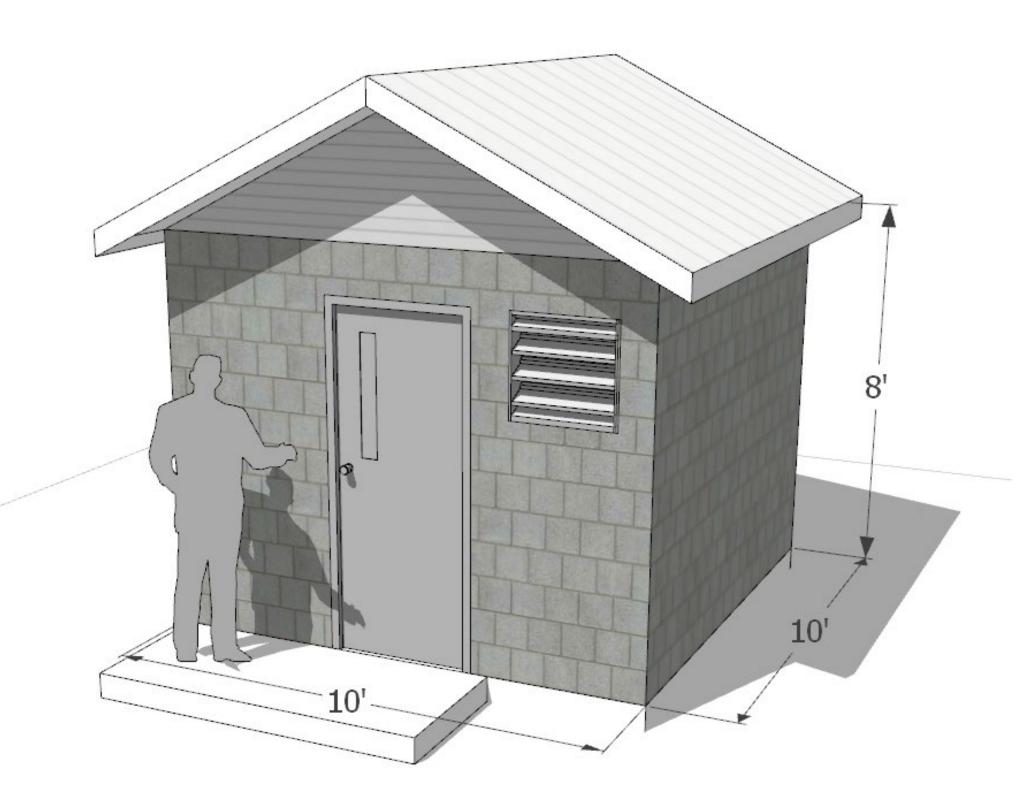
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Case Study

Parameters...

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



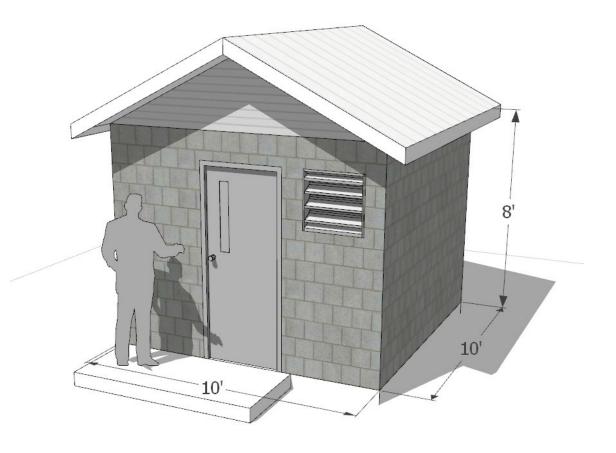
Case Study

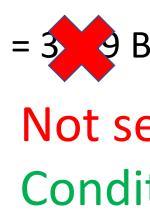
In order to classify as Semi-heated...

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

Parameters...

Symbol	ltem	Quantity
ОТ	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





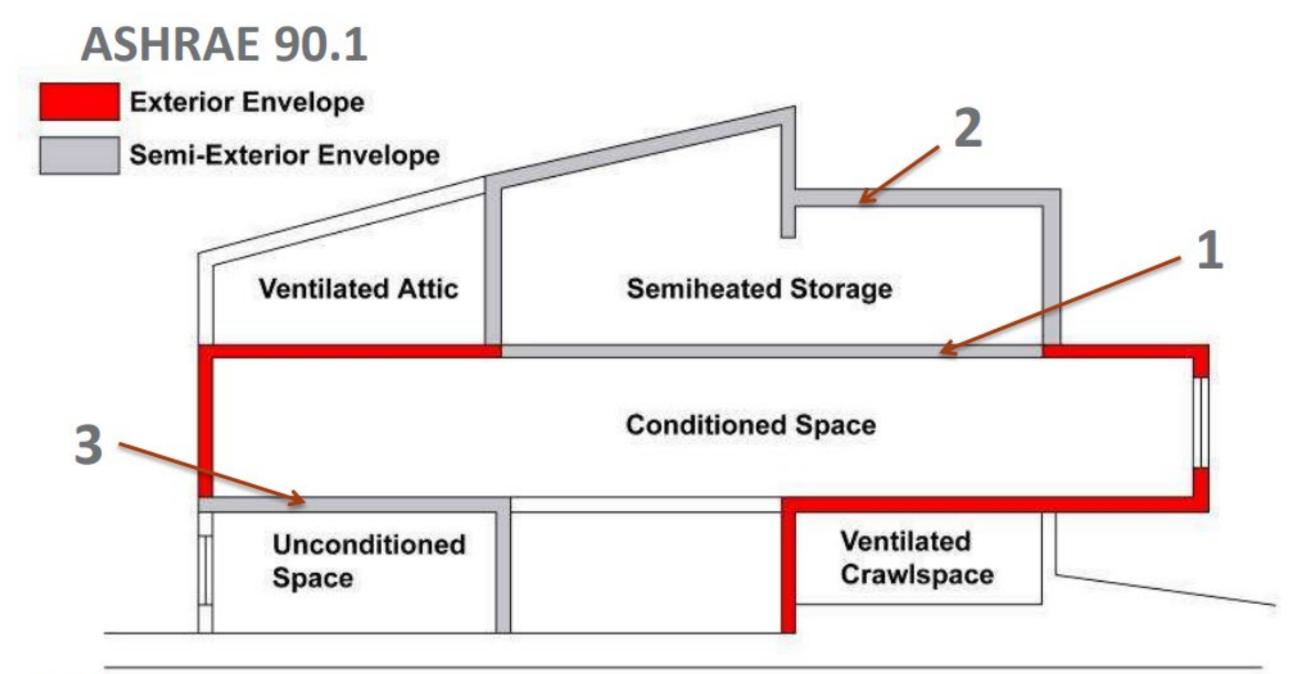
Not semi-heated Conditioned

= 3 9 Btu/hr > 800 Btu/hr

$((RA \times RU)+(WA \times WU)) \times (IT-OT)$

PDOC Calculation:

So where would I find a semi-heated space?



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 STRONG ARCHITECTURE

Building Section



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

Space Classification	Washington/Idaho	Orego
Unconditioned	None	None
Low Energy	Exempt	N/A
Semi-heated	Modified	Reduce
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)

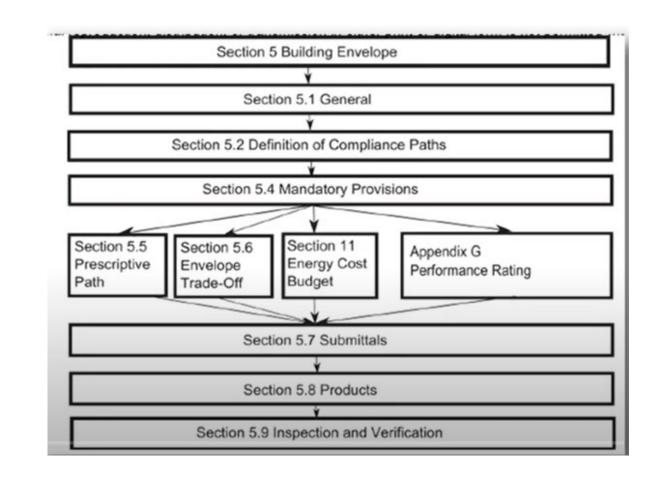
ed

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**
- Vestibule •
 - buildings

There are exceptions for smaller

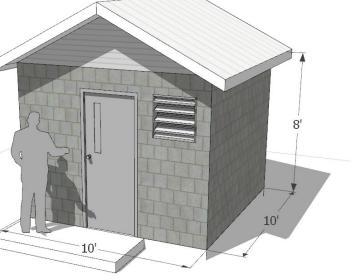
Semi-heated spaces are exempt Whole Building Air Leakage • Testing (there are exceptions)

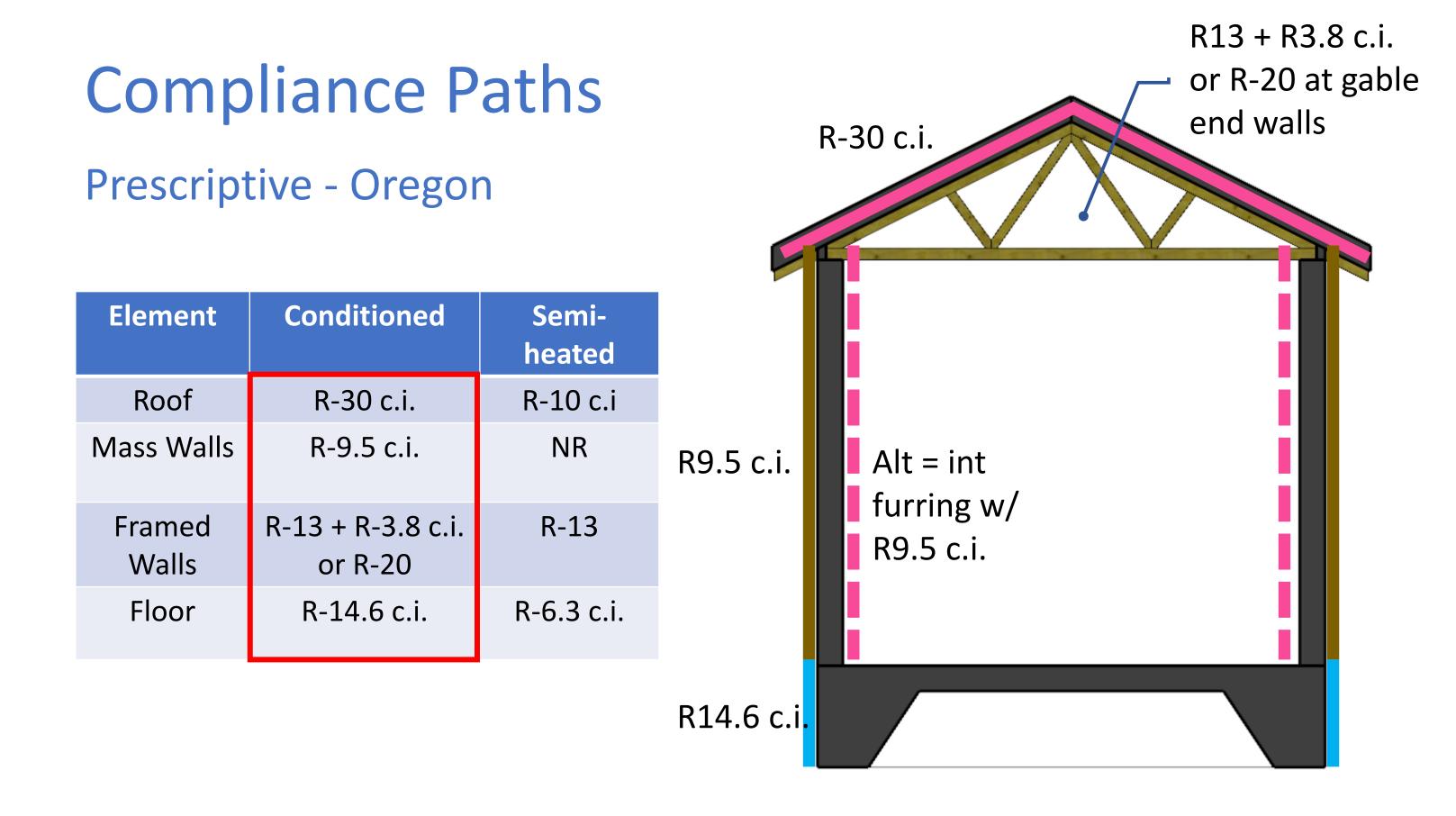
Prescriptive

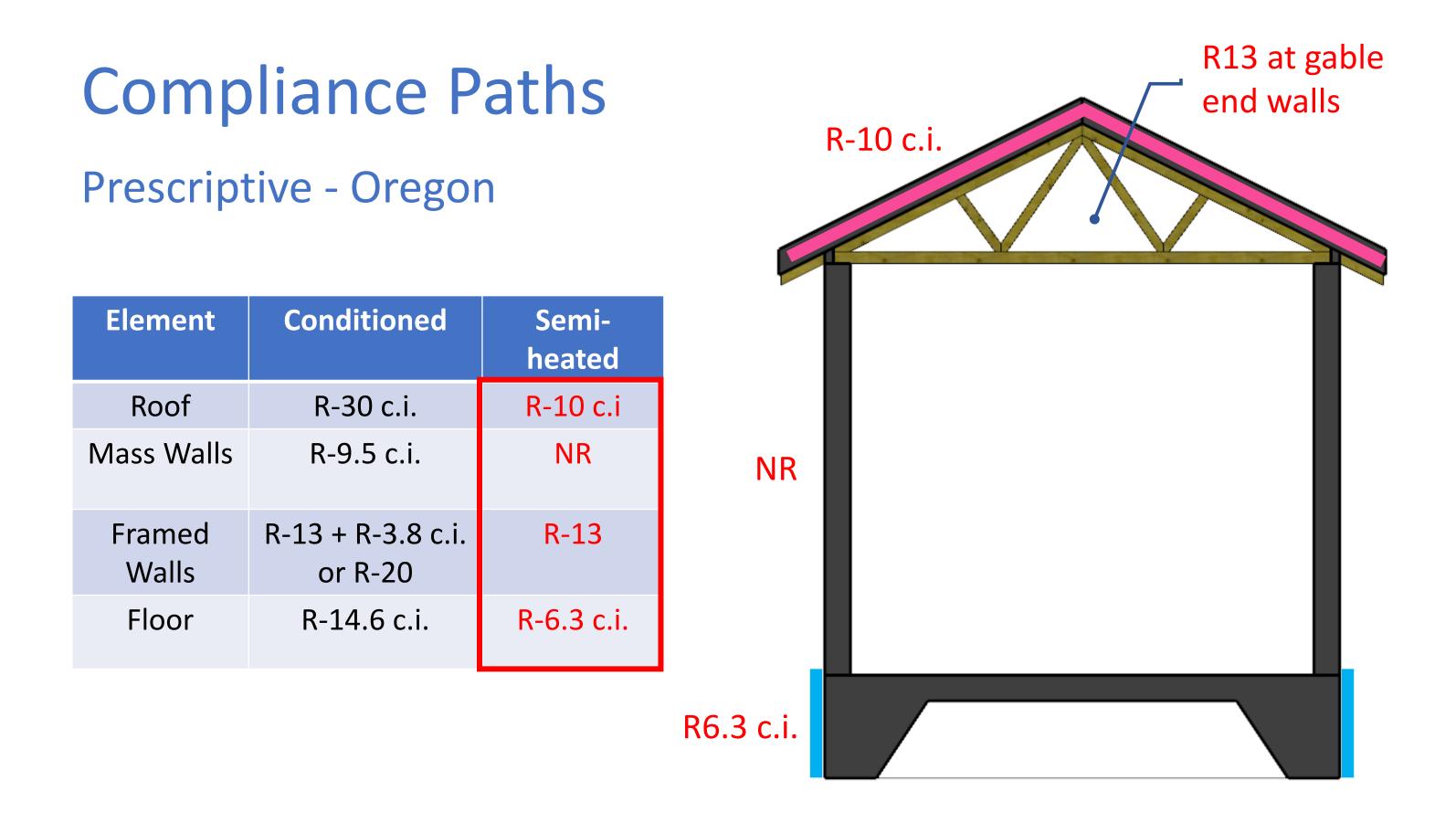
OR

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



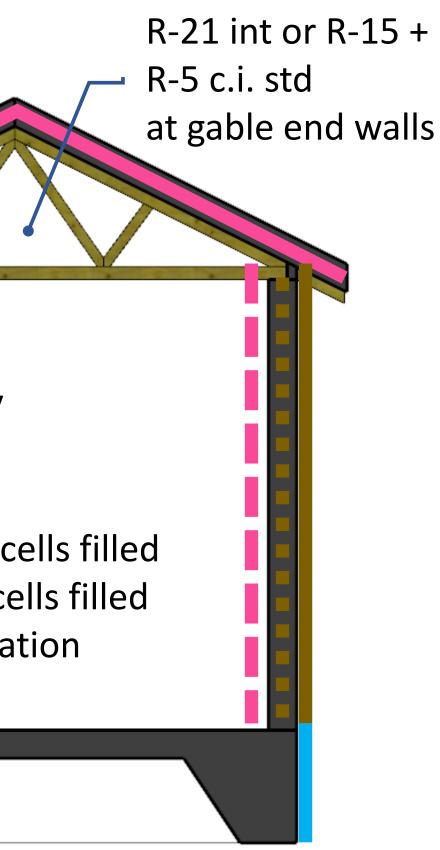




Comp	pliance P	aths		R-38 c.i.
Prescrip	tive – Washi	ngton/Ida	aho	N-30 C.I.
Element	Conditioned	Semi- heated		Alt 1 = int
Roof	R-38 c.i.	No change		furring w/
Mass Walls	R-9.5 c.i. ¹	R-9.5 c.i. ^{1,2}	R9.5 c.i.	R9.5 c.i.
Framed Walls	R-21 int or R-15 + R-5 c.i. std	R-21 int or R-15 + R-5		Alt 2 = all cel and 50% cell
		c.i. std ²		with insulati
Floor	R-10 for 24"	No change		
with insulation	filled and min 50% on n eated space, non-ele		R-10	
	cated space, non ele			

heating, separating semi-heated Spaces from exterior or low-energy spaces

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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

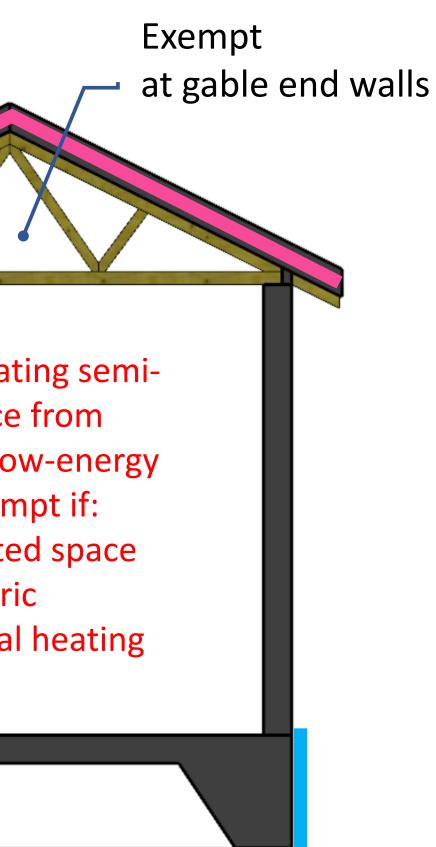
Spaces from exterior or low-energy spaces

STRONGWORK Architecture Walls separating semiheated space from exterior or low-energy space is exempt if:

R-38 c.i.

- Semi-heated space
- Non-electric mechanical heating

R-10



	Assembly	Conditioned	Sem	i-	COM-CHE	CK
Compliance Paths	Roof	R-30 c.i.	R-10	c.i	R-18 c.	i .
	Mass Walls	R-9.5 c.i.	NR		R-9.5 c.	i.
Trade-Off						
	Framed	R-13 + R-3.8 c.i.	R-13	3	R-13	
 Oregon COM-Check 	Walls	or R-20				
	Floor	R-14.6 c.i.	R-6.3	c.i.	None	
Conference Conference	ce case study	Save 🗈 🔋			n@strongworkarchitect	ure.com <u>Lo</u>
90.1 (2019) St	tandard			My Projects 🔻	Preferences	
New Project PROJECT ENVELOPE INT. L	IGHTING <u>Ext.</u> LIGHTIN	IG MECHANICAL REQUIREM	ENTS		🔁 Rep	orts 🔻
Row: 🥔 Edit 🔚 Duplicate 👔 Move Up 🗍 Move Down 🗙 Delete						Options
Add: Roof Skylight Ext. Wall Int. Wall Window Door Basement Floor						
Component As			Care	Anno 10 Const	on Insulation e R-Value	U-Factor
1 Roof Insulation Entirely At				707	18	0.053
2 Ext. Wall Concrete Block, 8in.,	asses		+0.	/%	9.5	0.086
3 Door Insulated Metal						0.37
4 Ext. Wall Concrete Block, 8in., 5 Ext. Wall Concrete Block, 8in., Solid Grouted	Manufacturing Facility			2.64	9.5	0.086
5 Ext. Wall Concrete Block, 8in., Solid Grouted North ✓ Medium Wei(✓ 6 Ext. Wall Concrete Block, 8in., Solid Grouted West ✓ Medium Wei(✓ 1	1 - Manufacturing Facility 1 - Manufacturing Facility	Furring: None		D ft ²	9.5	0.086
	1 - Manufacturing Facility	Furning. None		ft ²	5.5	0.25
	1 - Manufacturing Facility			2 ft ² 13	0	0.089
	1 - Manufacturing Facility		12	2 ft ² 13	0	0.089
IO Floor Unheated Slab-On-Grade 1	1 - Manufacturing Facility	No Insulat	tion 4	0 ft		

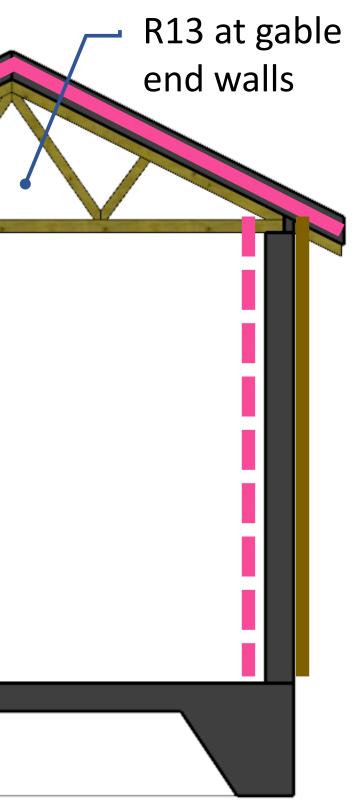
Envelope Passes Interior Lighting TBD Exterior Lighting TBD +0.7% ------

Trade-Off

Oregon COM-Check

Assemb ly	Condition ed	Semi-	COM- CHECK		
Roof	R-30 c.i.	R-10 c.i	R-18 c.i.		
Mass Walls	R-9.5 c.i.	NR	R-9.5 c.i.	R9.5 c.i.	Alt = int furring w/
Framed Walls	R-13 + R- 3.8 c.i. or R-20	R-13	R-13		R9.5 c.i.
Floor	R-14.6 c.i.	R-6.3 c.i.	None	None	

R-18 c.i.



In Practice

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

<image>

Green Building Advisor

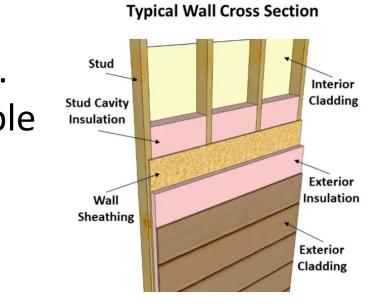
R9.5 c.i.

Florida Energy Solutions

National Masonry System Guide

R-30 c.i. -





Builderscalculator.com

R14.6 c.i.



Washington State Energy Program 2016

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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