



Introducing the Code Compliance Cookbook

to Help You Comply with the 2018 WSEC-R

Dan Wildenhaus – May 2022



Agenda

1. BetterBuiltNW
2. Goals
3. Cookbook Beta Test
4. Feedback session
5. Hand off to Jonathan Jones of WSU Energy Program
 - A. Insights on designing, building, and permitting in residential new construction
 - B. Code Compliance Submittal Forms
 - C. ERI, what if...?
 - D. What else can the C3 do for you?
6. Questions and Answers

Dan Wildenhaus

- Former contractor
- Technical Advisor and Industry Liaison
- New and existing construction
- Training and consultation
 - BetterBuiltNW
 - EPS New Construction Program



BetterBuilt^{NW}

- Resources
 - Case Studies and Research
 - Tools
 - News and Events
 - Training Opportunities and Resources
- Program information
 - Voluntary Home Certification Programs
 - New Construction Utility Programs
 - Partnerships with Organizations
- Features
 - Find a Professional
 - Find a Utility
 - Builder support – Energy Codes and beyond



Cookbook - Goals

Make code compliance an easier process.

Showcase trade-offs, options and unique considerations.

Identify resources and trainings.

Connect to builder and homeowner benefits.

Electric Air Source Heat Pump (ASHP) Home

House Size: Medium (1,500 to 5,000 sq. ft.)
Heating: ASHP w/gas backup
Water Heating: Gas Tankless

2018 WSEC-R Credit Package

#	Pts	Compliance Pathway	Alternative Pathway
1.4		R-21 Int with R4 ci4	R-23 Blown Insulation Int Frame with R3 ci (UA tradeoff)
1.4		Floor R-38	Floor R-38
1.4		Roof R-49	R-60 Adv Frame (UA tradeoff)
1.4	1	Windows U-0.25	Windows U-0.27 (UA Tradeoff)
2.2		Air Tightness 2.0 ACH50	Air Tightness 2.0 ACH50
2.2	1	Whole House Ventilation 65% efficient HRV	Whole House Ventilation 65% efficient HRV
3.2	1	Heating/Cooling 9.5 HSPF w/gas backup	Heating/Cooling 9.5 HSPF w/gas backup
4.2	1	Duct Location - Inside	Duct Location - Inside
5.3	1	Water Heating 0.91 UEF Gas Tankless	Water Heating 0.91 UEF Gas Tankless
-	1	406.2 Fuel Credit - Air Source Heat Pump	Air Source Heat Pump
6		Total Points Achieved	

ACRONYMS DEFINED

ACH50: Air changes per hour at 50 pascals pressure differential
ASRE: Adjusted Sensible Recovery Efficiency
HPWH: Heat Pump Water Heater
EF: Energy Factor
HSPF: Heating Seasonable Performance Factor
SEER: Seasonal Energy Efficiency Ratio

ALTERNATIVE PATHWAY

Builders challenged with continuous 1-inch exterior insulation and the cost for low U-factor windows may find an alternative package helpful. When switching to blown insulation and a half inch of rigid insulation, this can be traded off. Additionally, blown insulation may reduce building leakage rates, helping to achieve the tighter requirements associated with 2.2.

ITEMS THAT INCREASE VALUE

- Increased comfort
- Higher indoor air quality
- Energy efficient windows aligned with 2024 energy code
- Instant hot water and increased space without storage tank

ADDITIONAL HOMEOWNER BENEFITS

- Increased comfort – better envelope, more consistent heating/cooling
- HRVs or ERVs provide superior air quality and conserve energy
- Lower operational costs
- Likely qualifies for ENERGY STAR®

POTENTIAL BUILDER BENEFITS

- Reduced thickness of continuous insulation – Alternative Pathway
- Easier to price, source, and purchase windows
- Windows also meet code in Oregon
- Sales and marketing opportunities

MAINTENANCE

- Heat pump controls – homeowner education with setbacks
- Homeowner operations manuals are ideal to include maintenance schedules and tips for using newer technologies

RELATED TRAINING

- [Building with Ducts in Conditioned Spaces](#)
- [Top 10 Best Practices for Today's Homebuilder](#)
- [2018 WSEC-R: Build Tight & Ventilate Right Options](#)
- [2018 WSEC-R: Balanced Ventilation with HRVs & ERVs](#)
- [2018 WSEC-R: Code Compliance Overview](#)

Better

Build

NW

Cookbook – Beta test

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Code Compliance Calculator Example*

Helpful tip: The Code Compliance Calculator or “C3” is the recommended tool for performing UA tradeoffs for the 2018 WSEC-R. This calculator from Washing State Univerity Energy Program can also be used to document the code packages used for compliance, to calculate the design and size of ventilation systems, Heating and Cooling system sizing, and duct location. This calculator can be printed with custom settings to generate reports highlighting each of these components.

More info: www.energy.wsu.edu/BuildingEfficiency/EnergyCode.aspx

Project Information
Example Medium Dwelling Unit
6 Total Credits with Option 1.4
Air Source Heat Pump

Messages/Results
Review required for custom entries: Doors-Vertical Glazing-Wall (above grade)
UA Reduction = 58.5, Proposed UA is better than baseline by 18%
UA-Reduction meets selected Option 1.4

Results - Comparison of Baseline and Proposed Design (Alternative Pathway Values)							
Component Performance, R occupancies		Baseline			Proposed Design		
	U	Area	UA		U	Area	UA
Doors U =	0.3	38	11.3		0.3	38	11.3
Overhead Glazing U =	0.5	0	0			0	0
Vertical Glazing U =	0.3	350	105		0.278	350	95.6
Flat/Vaulted Ceilings U =	0.027	1,250	30.8		0.017	1,250	21.3
Walls (above grade) U =	0.056	2,466	134.4		0.045	2,466	106.5
Floors over Crawlspce U =	0.029	1,250	34.8		0.025	1,250	31.3
Baseline UA Total			325.9	Proposed UA Total			265.9
Required Credits			6	Proposed Credits			6
				UA % Reduction			18%
				UA Reduction			58.5

If the Proposed UA ≤ the Target UA, and the Proposed Credits from Table 406 are ≥ those required in Section R408, then the homes meets the WSEC

Cookbook – Beta test

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Code Compliance Submittal Forms

Helpful tip: Many jurisdictions are familiar with or require prescriptive forms available from Washington State University Energy Program. The Code Compliance Calculator can produce the same or very similar information that may be considered an acceptable form of compliance documentation. Please work with your local jurisdiction to determine if the Prescriptive forms below must be filled out and submitted or if the C3 print outs will suffice.

More info: www.energy.wsu.edu/BuildingEfficiency/EnergyCode.aspx

Traditional Approach

Required Reporting	Form/Submission
Baseline - R402.1.1	Prescriptive Worksheet
Fuel Normalization - R406.2	Prescriptive Worksheet
Energy Credits - R406.3	Prescriptive Worksheet
Ventilation Sizing	Compliance Cert or AHJ form
Heat System Sizing	Sizing Worksheet
Glazing Schedule	Glazing Schedule
Duct Leakage Results	Sizing Worksheet or Compliance Cert
Air Tightness Results	Compliance Cert

Code Compliance Calculator - C3 Approach

Required Reporting	Form/Submission
Baseline - R402.1.1	C3
Fuel Normalization - R406.2	C3
Energy Credits - R406.3	C3
Ventilation Sizing	C3 and Compliance Cert
Heat System Sizing	C3
Glazing Schedule	C3
Duct Leakage Results	C3 and Compliance Cert
Air Tightness Results	Compliance Cert

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45L Tax Credit & Above Code Programs

45L Tax Credit Report in RESNET Approved Modeling Software

Projected Rating: Based on Plans - Field Confirmation Required.

Normalized, Modified End-Use Loads (MMBtu/yr)			Envelope Loads (MMBtu/yr)		
	2006 IECC 50% Target	As Designed		2006 IECC 90% Target	As Designed
Heating	20.7	18.2	Heating	37.3	25.4
Cooling	3	4.3	Cooling	5.0	5.7
Total	23.5	22.5	Total	42.3	31.1

ENERGY STAR Home Report in RESNET Approved Modeling Software

Normalized, Modified End-Use Loads (MMBtu/yr)			
	ENERGY STAR v3.2 WA	As Designed	
Heating	21.4	13.2	
Cooling	0.5	0.6	
Water Heating	3.5	3.1	
Lights and Appliances	22.1	18.1	
Total	47.4	35.0	
ENERGY STAR HERS Target	69	50	HERS Index w/ PV
		50	HERS Index

HERS Index w/o PV ≤ ES HERS Index Target to Comply

Helpful tip: The 45L Tax Credit provides incentives of up to \$2,000 to builders who implement energy efficient construction and equipment in newly constructed homes. Builders who comply with the 2018 WSEC are building homes that are more than halfway to meeting minimum requirements for this federal tax credit. Several above code home certification programs that align with 45L should also be considered and are listed below.

More info: www.betterbuiltnw.com/find-a-professional

ENERGY STAR CERTIFIED HOMES

- EPA certification that showcases min. 10% energy savings over codes
- Relies on 3rd-party confirmation & assessment of installed measures
- Provides marketing collateral with a market recognized logo and name

DOE ZERO ENERGY READY HOMES

- Must meet ENERGY STAR as a baseline
- Marketed as Net Zero Ready, meaning that a reasonable amount of solar PV may lead to a net zero energy home
- Considered a robust certification that also includes Indoor Air Quality and resiliency metrics

TAX CREDITS

- Achieve both 50% reduction in loads compared to 2006 IECC, and 90% reduction in envelope loads compared to 2006 IECC
- ALWAYS work with a local Home Energy Rater for Tax Credit opportunities
- Many current WSEC-R homes are close to or may qualify for Tax Credits with minor upgrades

HERS & ERIs

- Home Energy Ratings and the HERS Index may be used for marketing homes on a normalized scale
- The ERI or Energy Rating Index is a type of index that may qualify homes for Energy Code in some jurisdictions, or as a pathway for compliance with Home Certification Programs



Questions?



Thank You

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Now to hand it off to Jonathan Jones!



Energy
Program
WASHINGTON STATE UNIVERSITY

WSU Energy Program

Building Efficiency