2012 IECC with Washington State Amendments

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Produced with funding from:

neea

WASHINGTON STATE UNIVERSITY
EXTENSION ENERGY PROGRAM

WSU Energy Program
Building Science Team

Staff provides building science expertise for:

- Residential energy code technical assistance
- Voluntary programs, Northwest ENERGYSTAR Homes
- Research and development, Building America
- Community-based upgrade programs
- Industry training and certifications; HERS, BPI, ENERGY STAR, PTCS

WSU Energy Program
Energy Code Support

Technical support provided in WA:

- Training offered throughout WA State
- Phone and email inquiry hotline support
- Energy code compliance tools
- Website
- Technical Advisory Groups (TAGs)

Energy Code Support in WA State

Residential

- Washington State University Energy Program
- 360-956-2042
- energycode@energy.wsu.edu
- www.energy.wsu.edu/code
- Gary Nordeen, Luke Howard, Tanya Beavers

Non-residential

- Northwest Energy Efficiency Council
- Lisa Rosenow
- 206-624-0283
- wsec@putnamprice.com
- www.neec.net

Code Development Process

Agency – State Building Code Council

Cycle – every three years

Energy Code Technical Advisory Group (TAG) – 26 individuals who represent the various stakeholders in the construction industry

- *SBCC approved transition to 2012 IECC with WA State amendments on Nov 30, 2012.*
- *Still needs to sit through current legislative session before finalized*.

https://fortress.wa.gov/ga/apps/sbcc/Page.aspx?nid=116

How Did We Get Here?

- 1978 – First Washington State Energy Code
- 1980 – Creation of Northwest Power Planning Council by Congress
- 1983 – First regional Power Plan by NWPPC
  - Plan included *Model Conservation Standards* (MCS)
- 1986 – Washington updates Energy Code
  - Halfway to full MCS requirements
- 1991 – Washington State Legislature mandates Energy Code requirements be raised to full MCS levels

What did we get?
1980 to 2008

- From 1980 to 2008 energy efficiency has:
  - Saved more than 4,000 average megawatts

- How much is 4,000 average megawatts?

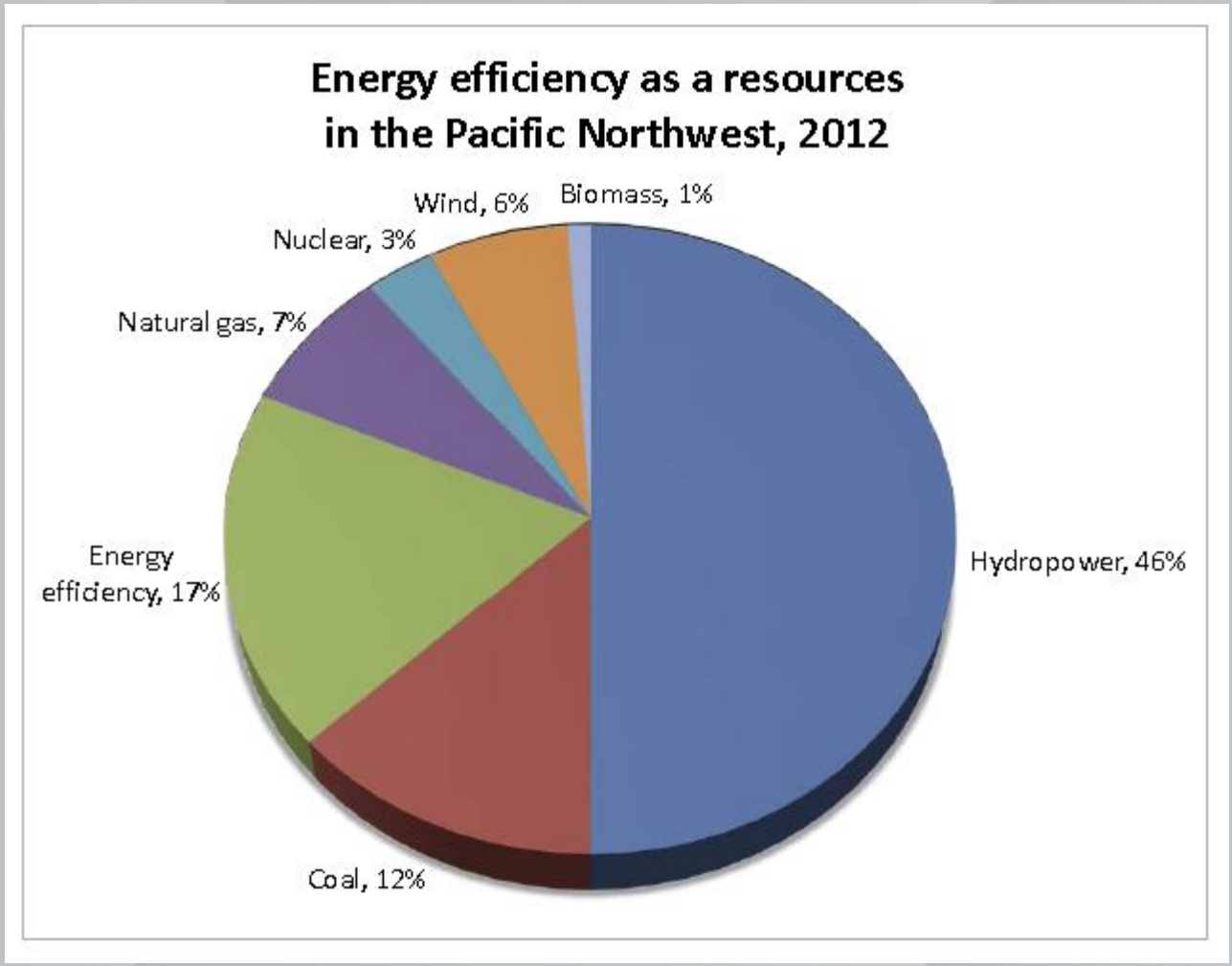
  - Enough energy to power all of Idaho and Western Montana and a city the size of Eugene (pop. 156,000)

What did we get? 1980 to 2008

- ½ the growth in electricity demand was met from conservation
- 8-10 coal or gas fired generation plants did not have to be built
- 15 million tons less CO2 in 2008 alone
- In 2008 consumers paid $1.8 billion less for electricity-even after paying for conservation programs

2011

- Saved 211 average megawatts
  - Enough electricity for 188,000 homes
  - Saved consumers $3.1 billion in energy costs in 2011 alone
- From 1980 to 2011 conservation has saved 5,000 average megawatts
  - Enough electricity to power ALL of Montana and Idaho
- 50% of the savings come from Washington
- 20% of the savings come from energy codes


Energy efficiency as a resources in the Pacific Northwest, 2012
Wind, 6%
Biomass, 1%
Nuclear, 3%
Natural gas, 7%
Energy efficiency, 17%
Hydropower, 46%
Coal, 12%

Code Layout

2009 WSEC	2012 WSEC
Chapters 1-10 SF, Duplex, Townhouses	Chapters 1-4 (RE) SF, Duplex, Townhouses, R-2, R-3, R-4 buildings ≤ 3 stories in height*
Chapters 11-15 Commercial R- Multi-Family	Chapters 1-4 (CE) All Commercial and R-1. Townhouses, R-2, R-3, R-4 buildings > 3 stories in height*
Ch. 10 Default U-Factors Ch. 3 Design Temperatures Chapter 9 Energy Credits	Appendix A Appendix B Table 406.2

*Refer to the International Building Code

See Handout

R101.2 Scope

Residential buildings and their:

- sites
- associated systems
- equipment

This code shall be the maximum and minimum energy code for residential construction in each town, city and county.

This addition was added to the IECC to comply with state law – RCW 19.27A.

R101.4.2 Historic Buildings

No change from WSEC – allows building official to allow alternate requirements that result in reasonable degree of efficiency for buildings of historical significance.

WSEC language added for flexibility

R101.4.3 Additions, Alterations, Renovations or Repairs

Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation.

- 2x4 framed walls insulated to R-15
- 2x6 framed walls insulated to R-21

WSEC language added for clarification

R101.4.3 Additions, Alterations, Renovations or Repairs

The building official can allow for less than full compliance if physically impossible and/or economically impractical and:

1. The alteration or repair improves the energy efficiency of the building; or

2. The alteration or repair is energy efficient and is necessary for the health, safety, and welfare of the general public.

No change from WSEC

R101.4.3.1 Mechanical Systems

WSEC language regarding duct testing in existing houses added in its entirety.

- Testing required but sealing is not
- Test results must be recorded on affidavit and presented to homeowner and building department

No change from WSEC

Duct Testing for Existing Construction

- Testing must be completed by certified technician
- Results provided to homeowner and building official on affidavit
- Exceptions:
  - Less than 40 lineal feet of ductwork outside conditioned space (combined supply and return)
  - Ducts containing asbestos
  - Ducts that have previously been tested
  - Ducts in additions less than 750 ft^2

Energy Code Support

WASHINGTON STATE UNIVERSITY EXTENSION ENERGY PROGRAM

Duct Leakage Test Results (Existing Construction)

Permit #: _____

House address or lot number: _____

City: _____ Zip: _____

Cond. Floor Area (ft^2): _____

☐ Duct tightness testing is not required for this residence per exceptions listed at the end of this document

Test Result: _____CFM@25Pa

Ring (circle one): Open 1 2 3

Duct Tester Location: _____

Pressure Tap Location: _____

I certify that these duct leakage rates are accurate and determined using standard duct testing protocol

Company Name: _____

Duct Testing Technician: _____

Technician Signature: _____ Date: _____

Phone Number: _____

Washington State Energy Code Reference:

R101.4.3.1 Mechanical Systems: When a space-conditioning system is altered by the installation or replacement of space-conditioning equipment (including replacement of the air handler, outdoor condensing unit of a split system air conditioner or heat pump, cooling or heating coil, or the furnace heat exchanger), the duct system that is connected to the new or replacement space-conditioning equipment shall be tested as specified in RS-33. The test results shall be provided to the building official and the homeowner.

Exceptions:

1. Duct systems that are documented to have been previously sealed as confirmed through field verification and diagnostic testing in accordance with procedures in RS-33.
2. Ducts with less than 40 linear feet in unconditioned spaces.
3. Existing duct systems constructed, insulated or sealed with asbestos.
4. Additions of less than 750 square feet.

See Handout

R101.4.4 Change in Occupancy or Use

Change of use needs to be brought into full compliance.

No change from WSEC

R102.1.1 Above Code Programs

- ~~The *Code Official* or other authority having jurisdiction shall be permitted to deem a national, state or local energy efficiency program to exceed the energy efficiency required by this code.~~

- This section of IECC deleted because of minimum-maximum code conflict.

R104.2.1. Wall Insulation Inspection

Wall insulation inspection after all wall insulation is in place and prior to cover.

WSEC language added because it is required by RCW 19.27A

R303.1.1 Insulation Certification

Insulation installers shall provide a certification listing:

- Type
- Manufacturer
- R-value of insulation installed in each element of the building thermal envelope.

R303.1.1.1 Insulation Certification

For blown or sprayed insulation (fiberglass and cellulose), the initial installed thickness, settled thickness, settled R-value, installed density, coverage area and number of bags installed shall be listed on the certification.

R303.1.1 Insulation Certification

For sprayed polyurethane foam (SPF) insulation, the installed thickness of the areas covered and R-value of installed thickness shall be listed on the certification.

R303.1.1 Insulation Certification

The insulation installer shall sign, date and post the certification in a conspicuous location on the job site.

Definition: NOMINAL R-VALUE:

The thermal resistance of insulation alone as determined in accordance with the U.S. Federal Trade Commission R-value rule.

www.ftc.gov/bcp/rulemaking/rvalue/index.shtml

R302.2 Exterior Design Conditions

- The heating or cooling outdoor design temperatures shall be selected from Appendix C

No change from WSEC.

Table 3-1 added as Appendix C.

TABLE 3-1
OUTDOOR DESIGN TEMPERATURES

Location	Outdoor Design Temp. (in °F) (heating)	Outdoor Design Temp. (in °F) (cooling)
Aberdeen 20 NNE	25.0	83
Anacortes	24.0	72
Anatone	-4.0	89
Auburn	25.0	84
Battleground	19.0	91
Bellevue	24.0	83
Bellingham 2 N	19.0	78
Blaine	17.0	73
Bremerton	29.0	83
Burlington	19.0	77
Chehalis	21.0	87

R303.1.3 Fenestration Product Rating

Exception:

Units without NFRC ratings produced by a small business* may be assigned default U-factors from Table R303.1.3(4) for vertical fenestration.

*See definition of “small business” in Chapter 2 [RE].

R401.2 Compliance

Projects shall comply with Sections identified as “mandatory” and with either:

- Prescriptive
- U-Factor Alternative
- Performance Approach

In addition, projects shall comply with Section R406 (2009 WSEC Chapter 9).

R401.2 Tools for Compliance

- Prescriptive – WSU form
- U-Factor Alternative – REScheck or other *approved* method
- Performance Approach – as required in R405

Check WSU's Energy Code webpage for compliance tool information as it becomes available: www.energy.wsu.edu/code

Prescriptive Energy Code Compliance for All Climate Zones in Washington

Project Information

Contact Information

This project will use the requirements of the Prescriptive Path below and incorporate the the minimum values listed. In addition, based on the size of the structure, the appropriate number of additional credits are checked as chosen by the permit applicant.

Authorized Representative _____ Date _____

All Climate Zones		
	R-Value[a]	U-Factor[a]
Fenestration U-Factor[b]	n/a	0.30
Skylight U-Factor	n/a	0.50
Glazed Fenestration SHGC[b,e]	n/a	n/a
Ceiling	49[j]	0.026
Wood Frame Wall[g,kl]	21 int	0.056
Mass Wall R-Value[i]	21/21[h]	0.056
Floor	30[g]	0.029
Below Grade Wall[c,k]	10/15/21 int + TB	0.042
Slab[d] R-Value & Depth	10, 2 ft	n/a

*Table R402.1.1 and Table R402.1.3 Footnotes included on Page 2.

Each dwelling unit in one and two-family dwellings and townhouses, as defined in Section 101.2 of the International Residential Code shall comply with sufficient options from Table R406.2 so as to achieve the following minimum number of credits:

☐ **1. Small Dwelling Unit: 0.5 points**
Dwelling units less than 1500 square feet in conditioned floor area with less than 300 square feet of fenestration area. Additions to existing building that are less than 750 square feet of heated floor

☐ **2. Medium Dwelling Unit: 1.5 points**
All dwelling units that are not included in #1 or #3, including additions over 750 square feet.

☐ **3. Large Dwelling Unit: 2.5 points**
Dwelling units exceeding 5000 square feet of conditioned floor area.

Table R406.2 Summary

Option	Description	Credit(s)			
1a	Efficient Building Envelope 1a	0.5		☐	
1b	Efficient Building Envelope 1b	1.0		☐	
1c	Efficient Building Envelope 1c	2.0		☐	
2a	Air Leakage Control and Efficient Ventilation 2a	0.5		☐	
2b	Air Leakage Control and Efficient Ventilation 2b	1.0		☐	
2c	Air Leakage Control and Efficient Ventilation 2c	1.5		☐	
3a	High Efficiency HVAC 3a	0.5		☐	
3b	High Efficiency HVAC 3b	1.0		☐	
3c	High Efficiency HVAC 3c	2.0		☐	
3d	High Efficiency HVAC 3d	1.0		☐	
4	High Efficiency HVAC Distribution System	1.0		☐	
5a	Efficient Water Heating	0.5		☐	
5b	Efficient Water Heating	1.5		☐	
6	Renewable Electric Energy	0.5		*1200 kwh	0.0
Total Credits					**0.00**

See Handout

Window, Skylight and Door Schedule

Project Information | *Contact Information*

Description	Ref.	U-factor	Qt.	Width Feet	Width Inch	Height Feet	Height Inch	Area	UA
Exempt Swinging Door (24 sq. ft. max.)								0.0	0.00
Exempt Glazed Fenestration (15 sq. ft. max.)								0.0	0.00
Sum of Exempt Door and Window Area and UA								0.0	0.00

Vertical Fenestration (Windows and doors)

Component Description	Ref.	U-factor	Qt.	Width Feet	Width Inch	Height Feet	Height Inch	Area	UA
								0.0	0.00
								0.0	0.00
								0.0	0.00
								0.0	0.00
								0.0	0.00
								0.0	0.00
								0.0	0.00
								0.0	0.00
								0.0	0.00
								0.0	0.00
								0.0	0.00
								0.0	0.00
								0.0	0.00
								0.0	0.00
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								0.0	0.00
								0.0	0.00
								0.0	0.00
								0.0	0.00
								0.0	0.00
								0.0	0.00
								0.0	0.00
Sum of Vertical Fenestration Area and UA								0.0	0.00
Vertical Fenestration Area Weighted U = UA/Area									0.00

Total Sum of Prescriptive Window and Door Area and UA 0.0 | 0.00

Overhead Glazing (Skylights)

Component Description	Ref.	U-factor	Qt.	Width Feet	Width Inch	Height Feet	Height Inch	Area	UA
								0.0	0.00
								0.0	0.00
								0.0	0.00
								0.0	0.00
								0.0	0.00
								0.0	0.00
Sum of Overhead Glazing Area and UA								0.0	0.00
Overhead Glazing Area Weighted U = UA/Area									0.00

See Handout

Simple Heating System Size: Washington State

This heating system sizing calculator is based on the Prescriptive Requirements of the 2012 Washington State Energy Code (WSEC) and ACCA Manuals J and S. This calculator will calculate heating loads only. ACCA procedures for sizing cooling systems should be used to determine cooling loads.

The glazing (window) and door portion of this calculator assumes the installed glazing and door products have an area weighted average U-factor of 0.30. The incorporated insulation requirements are the minimum prescriptive amounts specified by the 2012 WSEC.

Please fill out all of the green drop-downs and boxes that are applicable to your project. As you make selections in the drop-downs for each section, some values will be calculated for you. If you do not see the selection you need in the drop-down options, please call the WSU Energy Extension Program at (360) 956-2042 for assistance.

Project Information

Contact Information

Heating System Type: (●) All Other Systems ( ) Heat Pump

To see detailed instructions for each section, place your cursor on the word "Instructions".

Design Temperature

Instructions — Olympia, WA

Design Temperature Difference (ΔT) 53

ΔT = Indoor (70 degrees) - Outdoor Design Temp

Area of Building

Conditioned Floor Area

Instructions — Conditioned Floor Area (sq ft): 2,000

Average Ceiling Height

Instructions — Average Ceiling Height (ft): 8.0

Conditioned Volume: 16,000

	U-Factor	X	Area	=	UA
Glazing and Doors (Instructions)	0.30	X	360	=	108.00
Skylights (Instructions)	0.50	X	32	=	16.00
Insulation					
Attic (Instructions — R-49)	0.026	X	1,500	=	39.00
Single Rafter or Joist Vaulted Ceilings (Instructions — R-38 Vaulted)	0.027	X	500		13.50
Above Grade Walls *(see Figure 1)* (Instructions — R-21 Intermediate)	0.056	X	1,500		84.00
Floors (Instructions — R-38)	0.029	X	2,000		58.00
Below Grade Walls *(see Figure 1)* (Instructions — Select R-value)	No selection	X			---
Slab Below Grade *(see Figure 1)* (Instructions — Select conditioning)	No selection	X			---
Slab on Grade *(see Figure 1)* (Instructions — Select R-Value)	No selection	X			---

Location of Ducts (Instructions — Unconditioned Space)

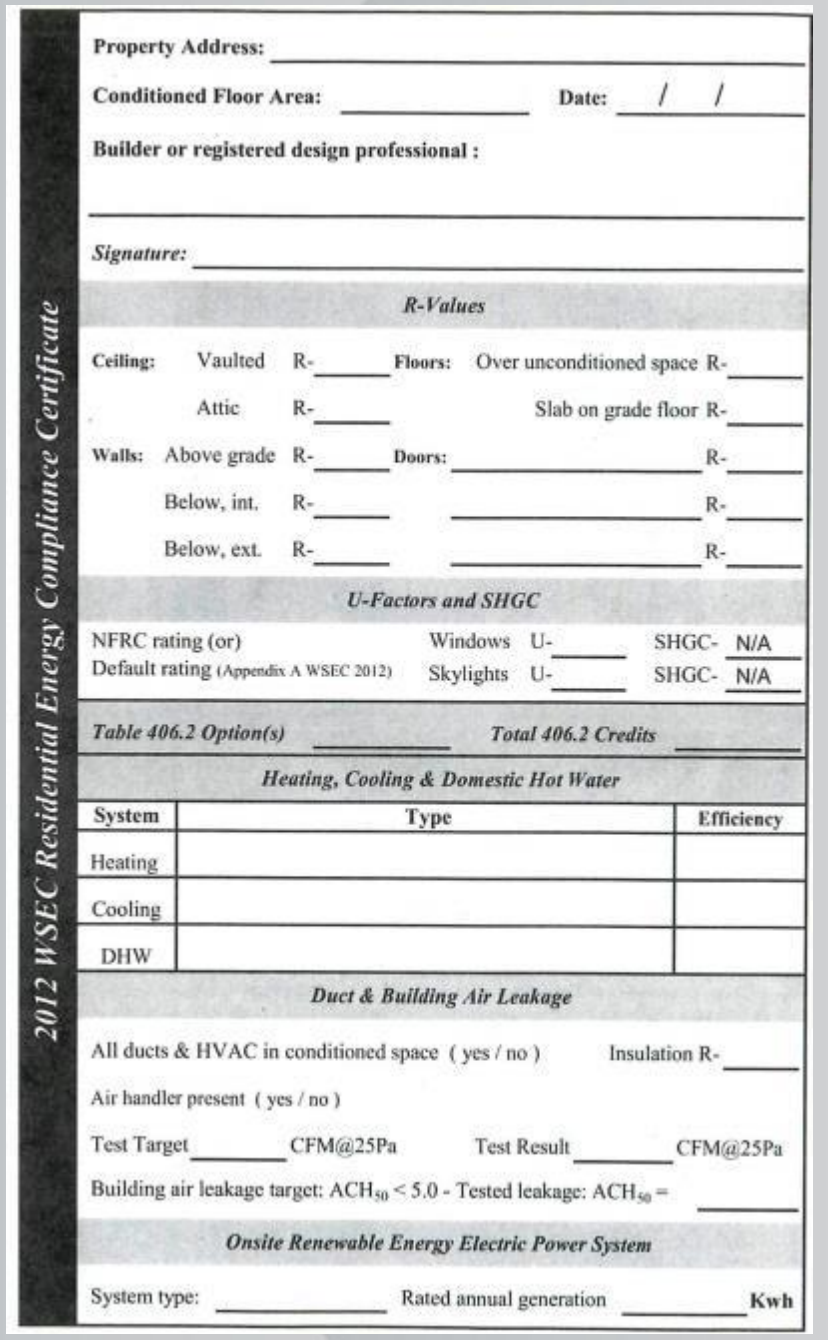
Duct Leakage Coefficient 1.10

Figure 1.

Sum of UA	318.50	
Envelope Heat Load *(Sum of UA x ΔT)*	16,881	Btu / Hour
Air Leakage Heat Load *(Volume x 0.018 x ΔT x DF)*	9,158	Btu / Hour
Building Design Heat Load *(Air Leakage + Envelope Heat Loss)*	26,039	Btu / Hour
Building and Duct Heat Load *(Ducts in unconditioned space: Sum of Building Heat Loss x 1.3 x DF; Ducts in conditioned space: Sum of Building Heat Loss x 1)*	28,643	Btu / Hour
Maximum Heat Equipment Outp *(Building and Duct Heat Loss x 1.4 for Forced Air Furnace; Building and Duct Heat Loss x 1.25 for Heat Pump)*	40,100	Btu / Hour

R401.3 Certificate

- Posted within 3' of electrical panel
  - Insulation
  - Windows
  - HVAC efficiency
  - Duct leakage
  - Air leakage
- Certificate is posted at: www.energy.wsu.edu/code



2012 WSEC Residential Energy Compliance Certificate

Property Address: _____

Conditioned Floor Area: _____ **Date:** / /

Builder or registered design professional :

_____

Signature: _____

R-Values

Ceiling: Vaulted R-_____ **Floors:** Over unconditioned space R-_____

Attic R-_____ Slab on grade floor R-_____

Walls: Above grade R-_____ **Doors:** _____ R-_____

Below, int. R-_____ _____ R-_____

Below, ext. R-_____ _____ R-_____

U-Factors and SHGC

NFRC rating (or) Windows U-_____ SHGC- N/A

Default rating (Appendix A WSEC 2012) Skylights U-_____ SHGC- N/A

Table 406.2 Option(s) _____ ***Total 406.2 Credits*** _____

Heating, Cooling & Domestic Hot Water

System	Type	Efficiency
Heating		
Cooling		
DHW		

Duct & Building Air Leakage

All ducts & HVAC in conditioned space (yes / no) Insulation R-_____

Air handler present (yes / no)

Test Target _____ CFM@25Pa Test Result _____ CFM@25Pa

Building air leakage target: $ACH_{50} < 5.0$ - Tested leakage: ACH_{50} = _____

Onsite Renewable Energy Electric Power System

System type: _____ Rated annual generation _____ **Kwh**

Climate Zones

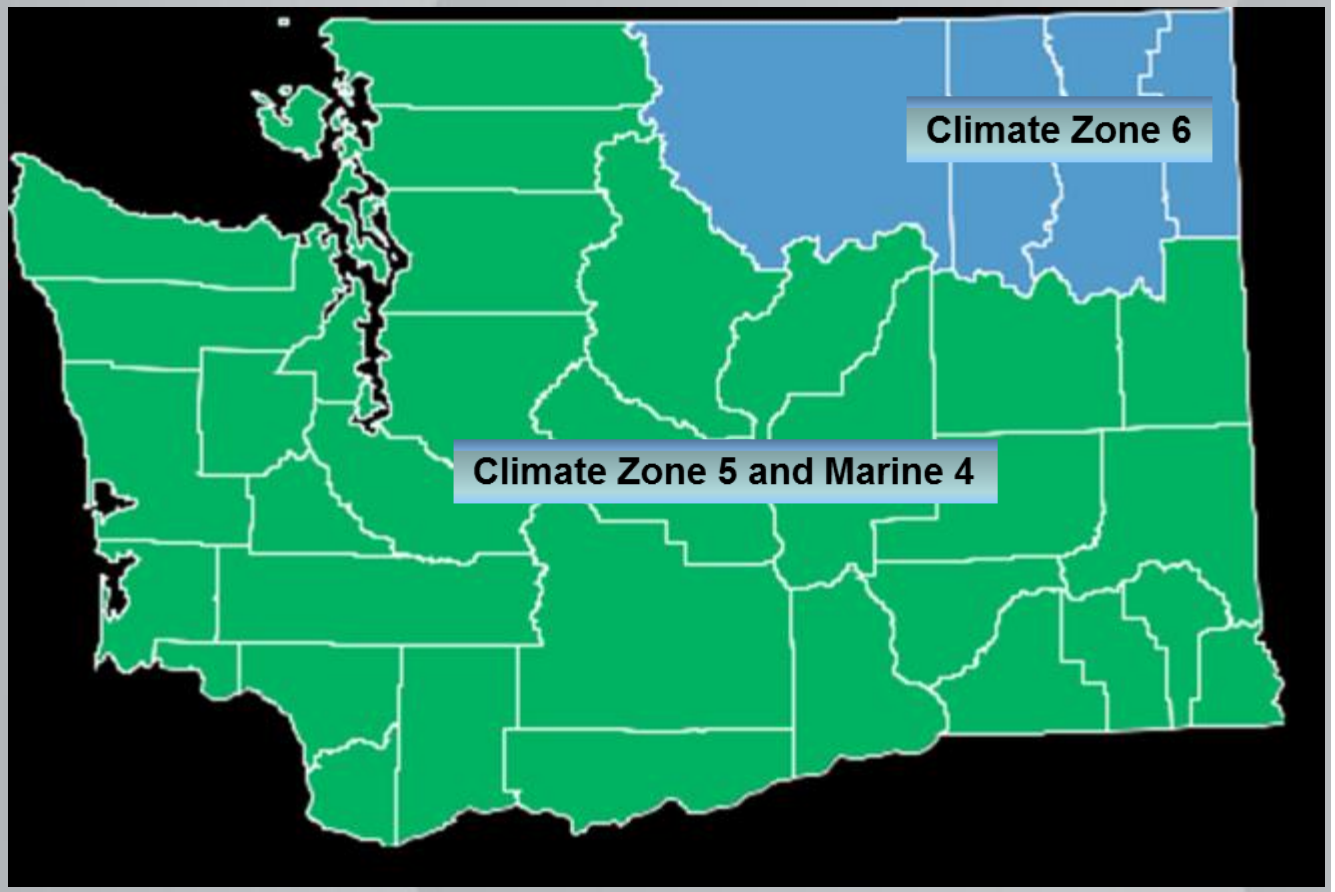


TABLE R301.1
CLIMATE ZONES, MOISTURE REGIMES, AND WARM-HUMID DESIGNATIONS BY STATE AND COUNTY

Key: A - Moist, B - Dry, C - Marine. Absence of moisture designation indicates moisture regime is irrelevant.

WASHINGTON

5B Adams	4C Lewis
5B Asotin	5B Lincoln
5B Benton	4C Mason
5B Chelan	5B Okanogan
4C Clallam	4C Pacific
4C Clark	5B Pend Oreille
5B Columbia	4C Pierce
4C Cowlitz	4C San Juan
5B Douglas	4C Skagit
5B Ferry	5B Skamania
5B Franklin	4C Snohomish
5B Garfield	5B Spokane
5B Grant	5B Stevens
4C Grays Harbor	4C Thurston
4C Island	4C Wahkiakum
4C Jefferson	5B Walla Walla
4C King	4C Whatcom
4C Kitsap	5B Whitman
5B Kittitas	5B Yakima
5B Klickitat	

Note that no Counties are listed as Zone 6

R402.1.1 Prescriptive Requirements

TABLE R402.1.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	5 AND MARINE 4	6
FENESTRATION U-FACTOR[b]	0.30	0.30
SKYLIGHT[b] U-FACTOR	0.50	0.50
GLAZED FENESTRATION SHGC[b, e]	NR	NR
CEILING R-VALUE[k]	49	49
WOOD FRAME WALL[g, m,n] R-VALUE	21 int	21+5ci
Mass Wall R-Value[i]	21/21[h]	21+5[h]
FLOOR R-VALUE	30[g]	30[g]
BELOW-GRADE[c,m] WALL R-VALUE	10/15/21 int + TB	10/15/21 int + TB
SLAB[d] R-VALUE & DEPTH	10, 2 ft	10, 4 ft

Although the charts in the code still show a Climate Zone 6 remember that all zones have the same requirements

R402.1 Footnotes

TABLE R402.1.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

Climate Zone	5,6 and Marine 4
Fenestration U-factor[b]	0.30
Skylight[b] U-factor	0.50
Glazed Fenestration SHGC[b, e]	NR
Ceiling R-Value[k]	49
Wood Frame Wall[g, m,n] R-Value	21 int
Mass Wall R-Value[i]	21/21[h]
Floor R-Value	30[g]
Below-Grade[c,m] Wall R-value	10/15/21 int + TB
Slab[d] R-Value & Depth	10, 2 ft

Footnote "K" allows the reduction from R-49 to R-38 for vaulted ceilings.

Footnote "D" requires continuous slab insulation under heated slabs.

Table 402.1.3
Equivalent U-Factors

TABLE R402.1.3
EQUIVALENT U-FACTORS[a]

CLIMATE ZONE	5 AND MARINE 4	6
FENESTRATION U-FACTOR	0.30	0.30
SKYLIGHT U-FACTOR	0.50	0.50
CEILING U-FACTOR	0.026	0.026
WOOD FRAME WALL U-FACTOR	0.056	0.044
Mass Wall U-FACTOR	0.056	0.044
FLOOR U-FACTOR	0.029	0.029
BELOW-GRADE WALL U-FACTOR	0.042	0.042

[a] Nonfenestration *U*-factors shall be obtained from measurement, calculation or an approved source or as specified in Section R402.1.3.

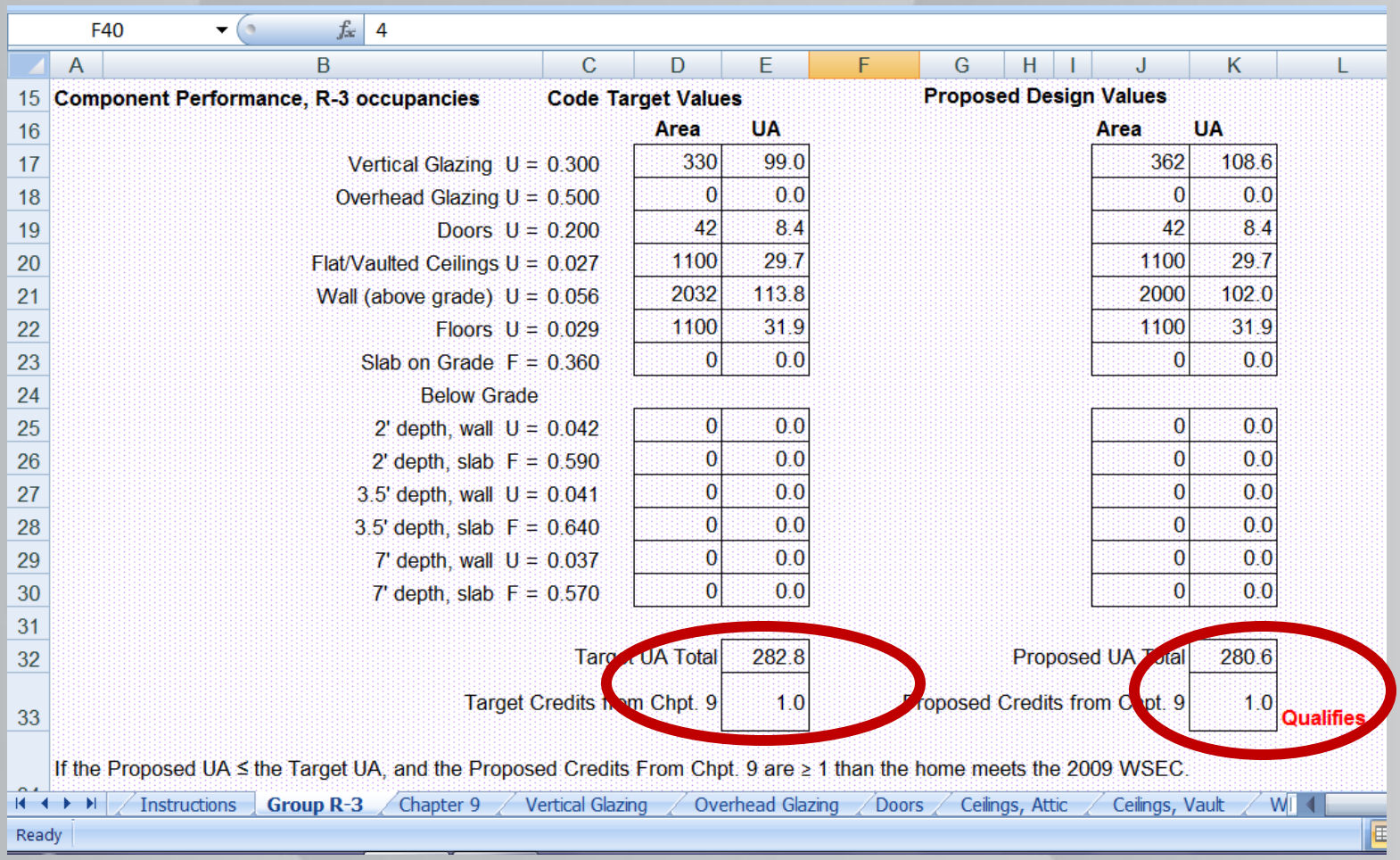
U-factors in Table 402.1.3 have been modified to reflect the R-values in Table 402.1.1.

R402.1.4 Total UA Alternative

- UA Alternative is formerly known as Component Performance.
- The U-factors for typical construction assemblies are included in Appendix A. Appendix A contains default U-factors from 2009 WSEC Chapter 10.
- Language was added with a 15% maximum glazing area for the target house when using the “Total UA Alternative” (Component Performance). 15% is the glazing percentage in RCW 19.27A.

UA Alternative

Building Envelope Trade-Off



F40 | 4

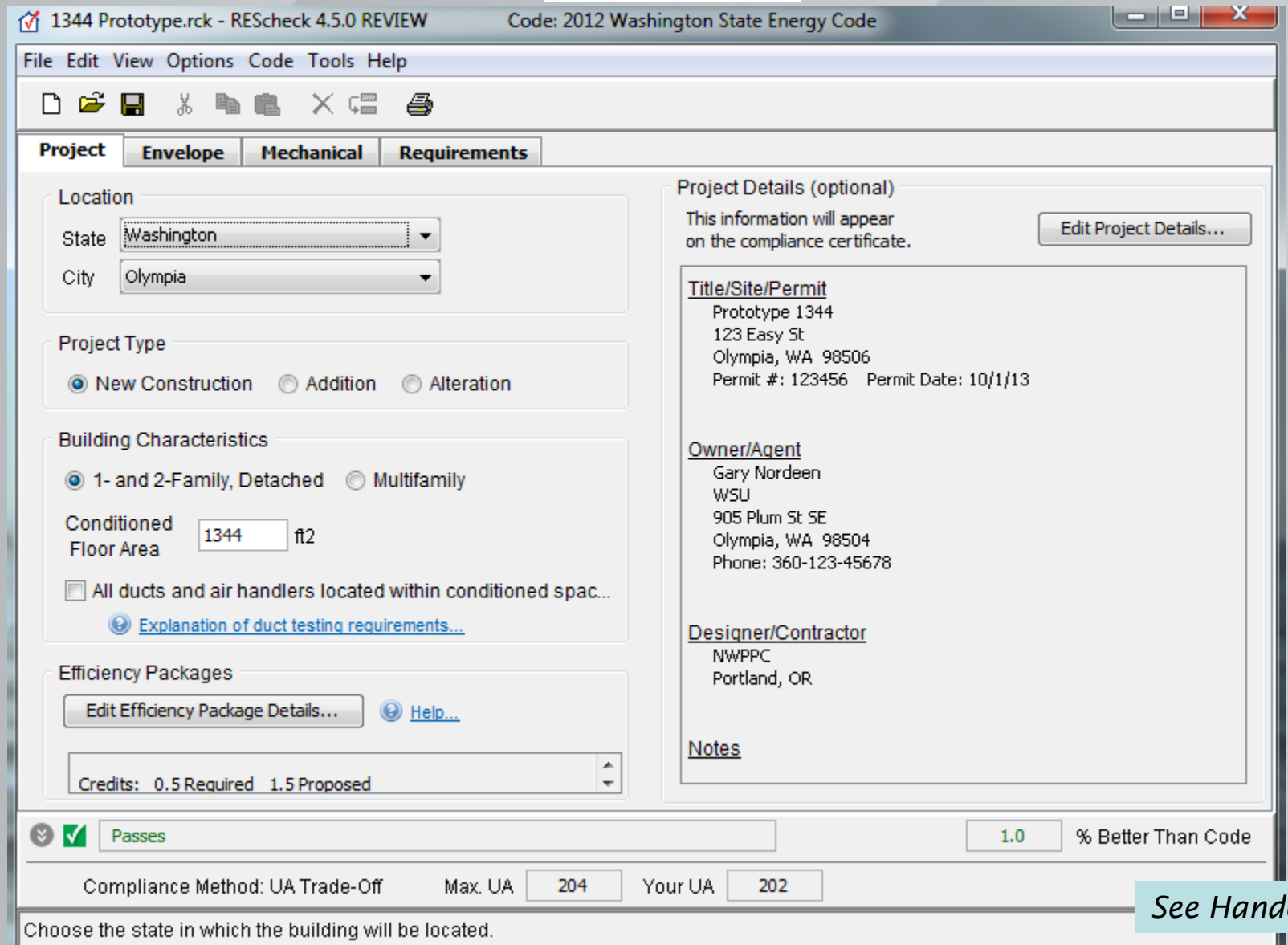
	Component Performance, R-3 occupancies	Code Target Values Area	UA	Proposed Design Values Area	UA
15					
16					
17	Vertical Glazing U = 0.300	330	99.0	362	108.6
18	Overhead Glazing U = 0.500	0	0.0	0	0.0
19	Doors U = 0.200	42	8.4	42	8.4
20	Flat/Vaulted Ceilings U = 0.027	1100	29.7	1100	29.7
21	Wall (above grade) U = 0.056	2032	113.8	2000	102.0
22	Floors U = 0.029	1100	31.9	1100	31.9
23	Slab on Grade F = 0.360	0	0.0	0	0.0
24	Below Grade				
25	2' depth, wall U = 0.042	0	0.0	0	0.0
26	2' depth, slab F = 0.590	0	0.0	0	0.0
27	3.5' depth, wall U = 0.041	0	0.0	0	0.0
28	3.5' depth, slab F = 0.640	0	0.0	0	0.0
29	7' depth, wall U = 0.037	0	0.0	0	0.0
30	7' depth, slab F = 0.570	0	0.0	0	0.0
31					
32	Target UA Total	282.8		Proposed UA Total	280.6
33	Target Credits from Chpt. 9	1.0		Proposed Credits from Chpt. 9	1.0

Qualifies

If the Proposed UA ≤ the Target UA, and the Proposed Credits From Chpt. 9 are ≥ 1 than the home meets the 2009 WSEC.

Instructions | Group R-3 | Chapter 9 | Vertical Glazing | Overhead Glazing | Doors | Ceilings, Attic | Ceilings, Vault | W

Ready


REScheck™
1344 Prototype.rck - REScheck 4.5.0 REVIEW
Code: 2012 Washington State Energy Code
File Edit View Options Code Tools Help
Project
Envelope
Mechanical
Requirements
Location
State Washington
City Olympia
Project Type
New Construction
Addition
Alteration
Building Characteristics
1- and 2-Family, Detached
Multifamily
Conditioned Floor Area 1344 ft2
All ducts and air handlers located within conditioned spac...
Explanation of duct testing requirements...
Efficiency Packages
Edit Efficiency Package Details...
Help...
Credits: 0.5 Required 1.5 Proposed
Project Details (optional)
This information will appear on the compliance certificate.
Edit Project Details...
Title/Site/Permit
Prototype 1344
123 Easy St
Olympia, WA 98506
Permit #: 123456 Permit Date: 10/1/13
Owner/Agent
Gary Nordeen
WSU
905 Plum St SE
Olympia, WA 98504
Phone: 360-123-45678
Designer/Contractor
NWPPC
Portland, OR
Notes
Passes
1.0
% Better Than Code
Compliance Method: UA Trade-Off
Max. UA 204
Your UA 202
Choose the state in which the building will be located.

See Handout

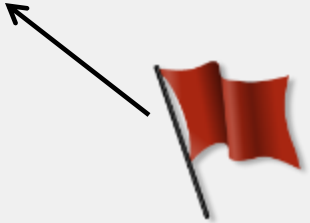
1344 Prototype.rck - REScheck 4.5.0 REVIEW Code: 2012 Washington State Energy Code

File Edit View Options Code Tools Help

Project | Envelope | Mechanical | Requirements

Ceiling | Skylight | Wall | Window | Door | Basement | Floor

	Component	Assembly	Gross Area		Cavity Insulation R-Value	Continuous Insulation R-Value	U-Factor	UA
	Building							
1	Ceiling 1	Flat Ceiling or Scissor Truss	1344	ft2	49.0	0.0	0.026	35
2	Wall 1	Wood Frame, 16" o.c.	1184	ft2	21.0	0.0	0.057	54
3	Window 1	Vinyl Frame:Double Pane ...	202	ft2			0.3	61
4	Door 1	Solid	40	ft2			0.2	8
5	Floor 1	Other Floor: Over Uncon...	1344	ft2			0.022	30



"Other" means a custom entry has been made.

Passes 7.8 % Better Than Code

Compliance Method: UA Trade-Off Max. UA 204 Your UA 188

Select the building assembly buttons above the column headers to create a list of envelope components for the building.

See Handout

RES*check* Software Version 4.5.0 REVIEW

Compliance Certificate

Project Prototype 1344

Energy Code:	**2012 Washington State Energy Code**
Location:	**Olympia, Washington**
Construction Type:	**Single-family**
Project Type:	**New Construction**
Conditioned Floor Area:	**1,344 ft2**
Glazing Area	**15%**
Climate Zone:	**4**
Permit Date:	**10/1/13**
Permit Number:	**123456**

Construction Site:
123 Easy St
Olympia, WA 98506

Owner/Agent:
Gary Nordeen
WSU
905 Plum St SE
Olympia, WA 98504
360-123-45678

Designer/Contractor:
NWPPC
Portland, OR

Compliance: Passes using UA trade-off

Compliance: **7.8% Better Than Code** Maximum UA: **204** Your UA: **188**

The % Better or Worse Than Code Index reflects how close to compliance the house is based on code trade-off rules.
It DOES NOT provide an estimate of energy use or cost relative to a minimum-code home.

Envelope Assemblies

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Glazing or Door U-Factor	UA
Ceiling 1: Flat Ceiling or Scissor Truss	1,344	49.0	0.0	0.026	35
Wall 1: Wood Frame, 16" o.c.	1,184	21.0	0.0	0.057	54
Window 1: Vinyl Frame:Double Pane with Low-E	202			0.300	61
Door 1: Solid	40			0.200	8
Floor 1: Other Floor: Over Unconditioned Space	1,344			0.022	30

Additional Efficiency Package(s)

Credits: 0.5 Required 1.5 Proposed

Description	Credits
5b: SHW: Fossil fueled EF >=0.82 or solar/heat pump	1.5

See Handout

RES*check* Software Version 4.5.0 REVIEW

Inspection Checklist

Energy Code: 2012 Washington State Energy Code

Requirements: 0.0% were addressed directly in the RES*check* software

Text in the "Comments/Assumptions" column is provided by the user in the REScheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

Section # & Req.ID	Pre-Inspection/Plan Review	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
103.1, 103.2 [PR1][1]	Construction drawings and documentation demonstrate energy code compliance for the building envelope.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
103.1, 103.2, 403.7 [PR3][1]	Construction drawings and documentation demonstrate energy code compliance for lighting and mechanical systems. Systems serving multiple dwelling units must demonstrate compliance with the IECC Commercial Provisions.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
302.1, 403.6 [PR2][2]	Heating and cooling equipment is sized per ACCA Manual S based on loads calculated per ACCA Manual J or other methods approved by the code official.	Heating: Btu/hr____ Cooling: Btu/hr____	Heating: Btu/hr____ Cooling: Btu/hr____	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

See Handout

R402.2.1.1 Loose Insulation in Attics

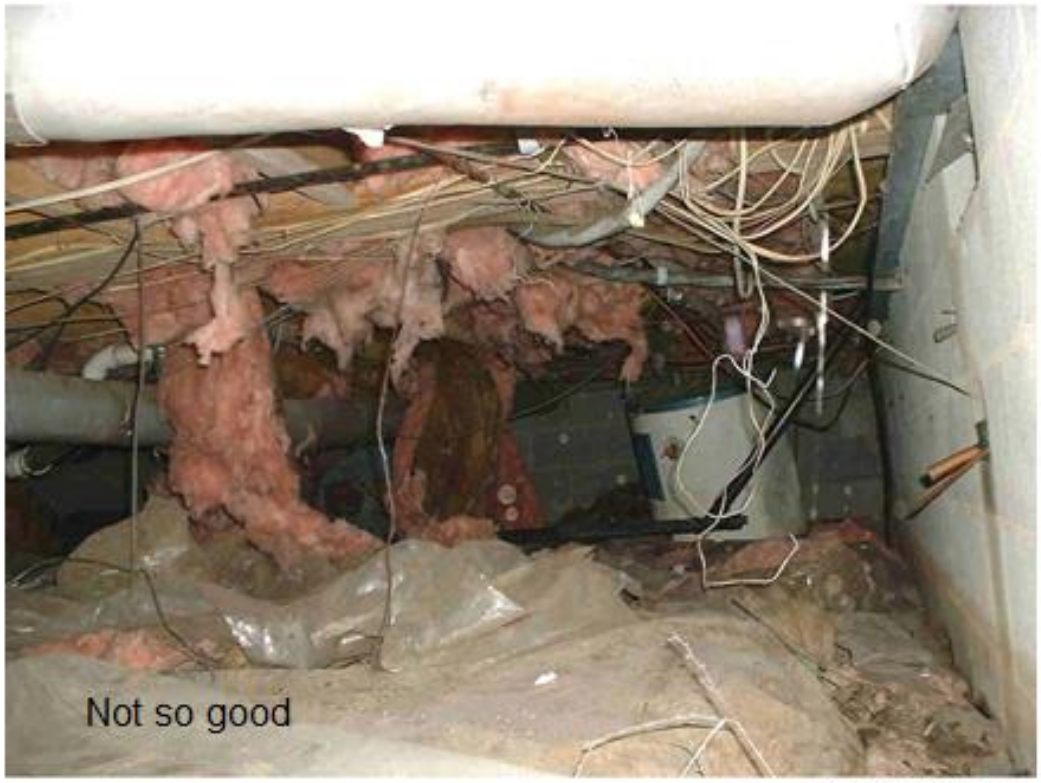
Loose insulation in attic spaces-

Open-blown or poured loose fill insulation may be used in attic spaces where the slope of the ceiling is not more than 3 feet in 12 and there is at least 30 inches of clear distance from the top of the bottom chord of the truss or ceiling joist to the underside of the sheathing at the roof ridge.

Language from WSEC added for clarity when blowing in attic insulation.

R402.2.7 Floors

R402.2.7 Floors. Floor insulation shall be installed to maintain permanent contact with the underside of the subfloor decking.

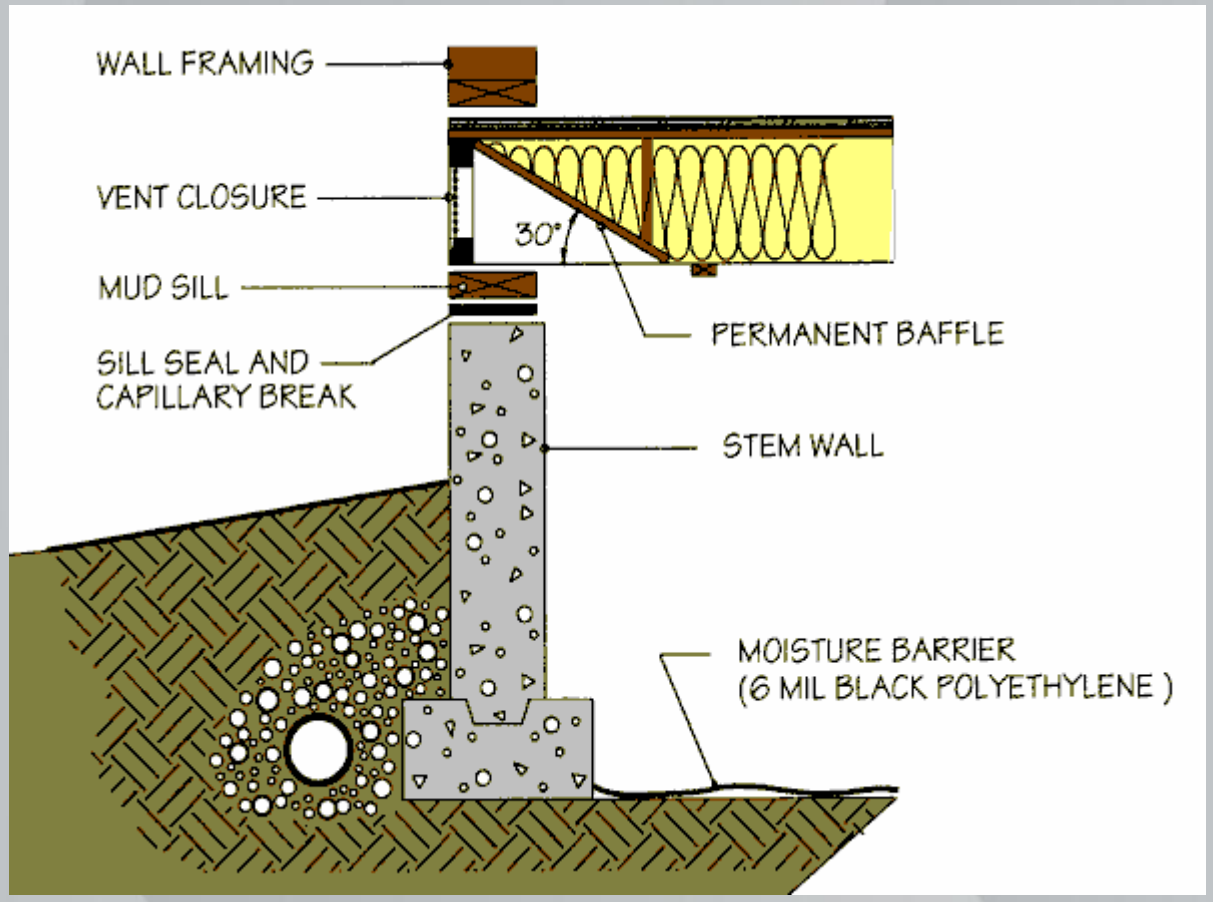


R402.2.7 Floors

R402.2.7 Floors. Insulation supports shall be installed so spacing is no more than 24 inches on center. Foundation vents shall be placed so that the top of the vent is below the lower surface of the floor insulation.

Exceptions:

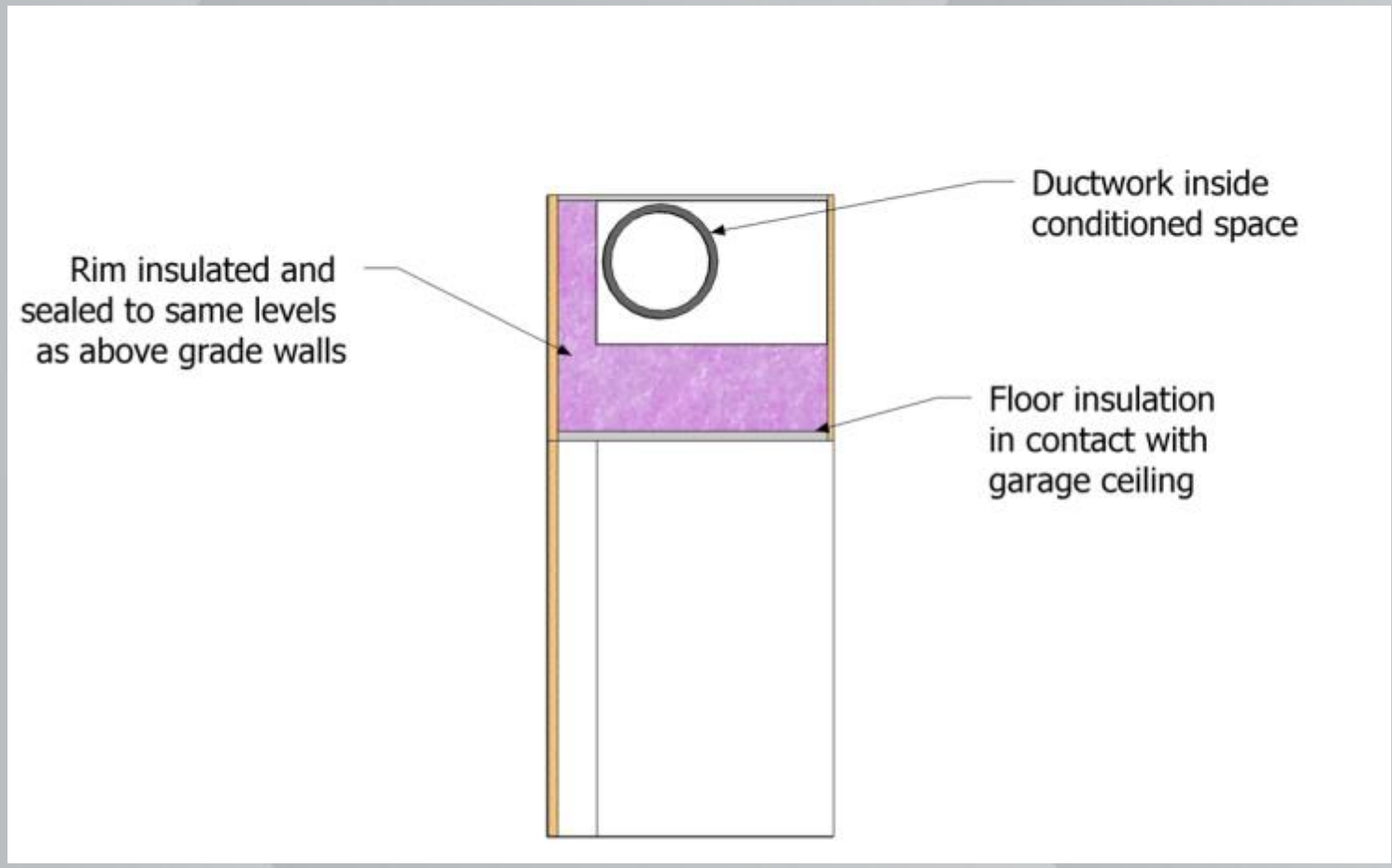
When foundation vents are not placed so that the top of the vent is below the lower surface of the floor insulation, a permanently attached baffle shall be installed at an angle of 30° from horizontal, to divert air flow below the lower surface of the floor insulation.



WSEC language added for insulation support requirements.

Exceptions:

Substantial contact with the surface being insulated is not required in enclosed floor/ceiling assemblies containing ducts where full depth insulation is installed between the duct and the exterior surface.



R402.2.8 Basement walls

- Exterior Insulation
  - R-10 Continuous
- Interior Insulation
  - R-15 Continuous

R-21 Cavity
(allowed but no
recommended)

R402.2.8 Basement walls

Vapor retarders below grade are not recommended

R702.7 Vapor retarders. Class I or II vapor retarders are required on the interior side of frame walls in Climate Zones 5, 6, 7, 8 and Marine 4.

Exceptions:

1. Basement walls.
2. Below grade portion of any wall.
3. Construction where moisture or its freezing will not damage the materials.

2012 INTERNATIONAL RESIDENTIAL CODE®

R402.2.9.1 Radiant slabs (Mandatory)

The entire area of a radiant slab shall be thermally isolated from the soil with a minimum of R-10 insulation.

R402.2.10 Crawl space walls

This section deleted in its entirety.

Unvented crawl spaces are not prescriptively allowed.

R402.2.12 Sunroom insulation
R402.3.5 Sunroom *U*-factor

These sections deleted in their entirety.

These sections deleted. Less stringent than the WSEC.

R402.4.1.2 Air Leakage Testing

Air leakage testing based on “air changes per hour” and not “specific leakage area”.

SLA .00030 = 5.9 ACH_{50}

The IECC maximum leakage rate is 3 ACH_{50}.

5.0 ACH_{50} = SLA .00027

This was changed to 5 ACH_{50} for WA.

R402.4.1.2 Air Leakage Testing

- Blower door testing required for all new construction
- Results reported on certificate
- Home must not exceed maximum leakage rate

  5.0 ACH50

$5.0\ ACH_{50}$ = SLA .00027

R402.4.1.2 Air Leakage Testing

- Test done in closed house condition
- Depressurize house to 50 Pascals
- Air flow through the fan = air flow through leaks in the building envelope
- Convert CFM to ACH50
- *Who can test?*

How to Calculate ACH_{50}

- Determine leakage rate of house with blower door (CFM @ 50 pascals)
- Calculate to volume of the house (ft^3)

$$ACH_{50} = (CFM \times 60) \div Volume$$

How to Calculate ACH_{50}

- 2,000 Ft^2 house
- Volume = 16,000 Ft^3 (2,000 x 8)
- Blower door CFM = 1300 CFM
  - ACH_{50} = (CFM X 60) ÷ Volume
  - ACH_{50} = (1300 X 60) ÷ 16,000
  - ACH_{50} = 78,000 ÷ 16,000
  - **ACH_{50} = 4.8**

R403.1.2 Heat Pump Supplementary Heat (Mandatory)

All heat pumps installed under this section shall include the capability to lock out the supplementary heat based on outdoor temperature. This control shall have a maximum setting of 40° F. At final inspection, the lock out control shall be set to 35° F or less.

WSEC language added for clarity. IECC does not cite outdoor temperatures.

2012 Duct Insulation (Prescriptive)

- Ducts shall be insulated to a minimum of R-8

  Exception: *Ducts or portions thereof located completely inside the building thermal envelope. Ducts located in crawl spaces do not qualify for this exception.*

R403.2.2 Duct Testing (Mandatory)

Duct testing required in all new construction

- Maximum leakage rates are 4% of the conditioned floor area
- Same rate for total leakage and leakage to exterior
- Testing done by certified technician
- Results documented on affidavit

Energy Code Support

WASHINGTON STATE UNIVERSITY EXTENSION ENERGY PROGRAM

Duct Leakage Affidavit (New Construction)

Permit #: _____

House address or lot number: _____

City: _____ Zip: _____

Cond. Floor Area (ft²): _____ Source (circle one): Plans Estimated Measured

☐ Duct tightness testing is not required. The total leakage test is not required for ducts and air handlers located entirely within the building thermal envelope. Ducts located in crawl spaces do not qualify for this exception.

Air Handler in conditioned space? ☐ yes ☐ no Air Handler present during test? ☐ yes ☐ no

Circle Test Method: Leakage to Outside Total Leakage

Maximum duct leakage:

Post Construction, total duct leakage: (floor area x .04) = _____CFM@25 Pa

Post Construction, leakage to outdoors: (floor area x .04) = _____CFM@25 Pa

Rough-In, total duct leakage with air handler installed: (floor area x .04) = _____CFM@25 Pa

Rough-In, total duct leakage with air handler not installed: (floor area x .03) = _____CFM@25 Pa

Test Result: _____CFM@25Pa

Ring (circle one if applicable): Open 1 2 3

Duct Tester Location: _____ Pressure Tap Location: _____

I certify that these duct leakage rates are accurate and determined using standard duct testing protocol.

Company Name: _____ Technician: _____

Technician Signature: _____

Date: _____

Phone Number: _____

See Handout

Ducts

- Installation of ducts in exterior walls, floor or ceilings cannot displace required insulation
- Building cavities cannot be used as ducts

R403.4.2 Hot Water Pipe Insulation (Prescriptive)

This IECC section deleted in its

IECC language deleted to minimize confusion. All hot water pipes are required to be insulated to ~~R-3~~ (WSR 13-23-095 EMERGENCY RULE)

403.4.3 Electric Water Heater Insulation

All electric water heaters in unheated spaces or on concrete floors shall be placed on an incompressible, insulated surface with a minimum thermal resistance of R-10.

WSEC language added for water heaters installed in unheated spaces or on slabs.

R404.1 Lighting Equipment (Mandatory)

A minimum of 75 percent of the lamps in permanently installed lighting fixtures shall be high-efficacy lamps.

R404.2 Exterior Lighting

~~Luminaires providing outdoor lighting and permanently mounted to a residential building or to other buildings on the same lot shall be high efficacy luminaires.~~

~~**EXCEPTIONS:**~~

~~Permanently installed outdoor luminaires that are not high efficacy shall be allowed provided they are controlled by a motion sensor(s) with integral photocontrol photosensor.~~

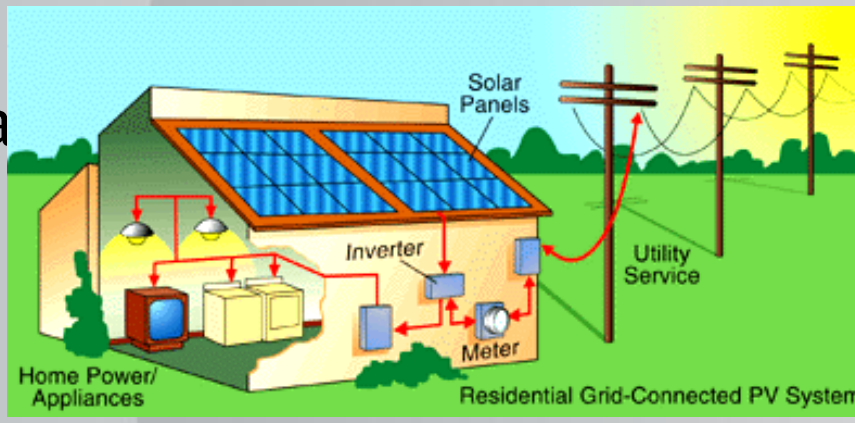
~~Permanently installed luminaires in or around swimming pools, water features~~

Residential Rooftop Solar PV Systems

- Installation of residential rooftop solar photovoltaic systems just got easier and less expensive!

Residential Rooftop Solar PV Systems

- What is a solar rooftop solar PV system?
  - A system that converts sola radiation (sunlight) into usable direct current (DC) electricity



- A system will include
  - Solar modules
  - Invertor(s) to change direct current to alternating current
  - Attachment hardware

What has changed to make installations easier?

- The SBCC approved a change to IRC Section M2302 effective July 1, 2014
  - This change allows the installation of residential rooftop solar systems meeting specific criteria without the need for an engineering analysis.
  - Engineering costs can add an additional cost of $500 – $2500+
  - Additional project wait times could be up to 8 weeks

What exempts a PV system from engineering?

- The solar photovoltaic panel system shall be designed for the wind speed of the local area, and shall be installed per the manufacturer's specifications.
- The ground snow load does not exceed 70 pounds per square foot.

What exempts a PV system from engineering?

- The total dead load of modules, supports, mountings, raceways, and all other appurtenances weigh no more than four pounds per square foot.
  - Total weight of PV modules and rails / total surface area of the modules

What exempts a PV system from engineering?

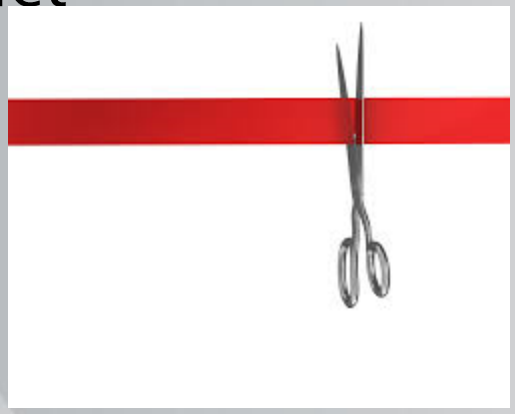
- Photovoltaic modules are not mounted higher than 18 inches above the surface of the roofing to which they are affixed.

What exempts a PV system from engineering?

- Supports for solar modules are to be installed to spread the dead load across as many roof framing members as needed, so that no point load exceeds 50 pounds.

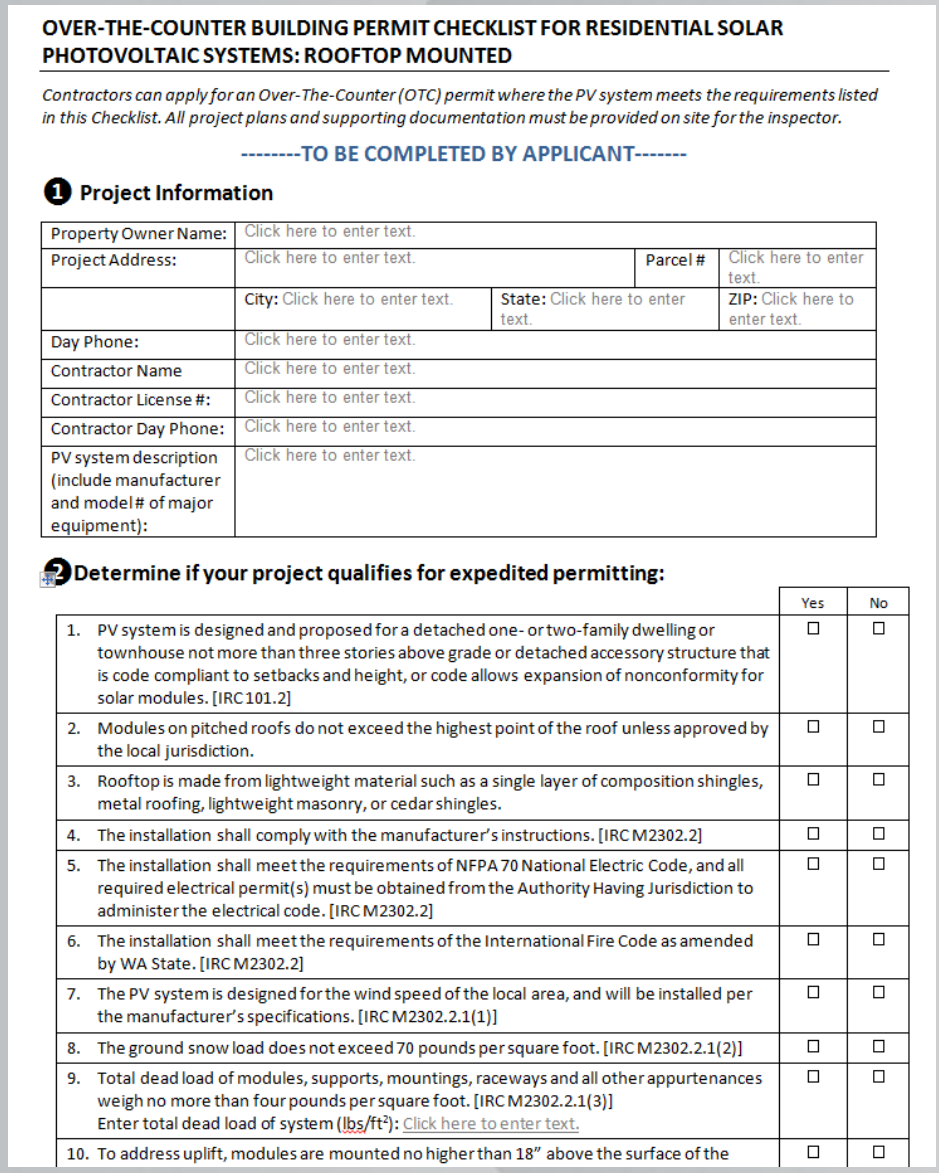
Does this rule exempt solar PV from permits?

- No. You will need:
  - A building permit but some jurisdictions exempt solar PV projects from needing a building permit
  - An electrical permit issued by the jurisdiction or from L&I
  - Fire code requirements must be met



Checklists

Building Permit Checklist



OVER-THE-COUNTER BUILDING PERMIT CHECKLIST FOR RESIDENTIAL SOLAR PHOTOVOLTAIC SYSTEMS: ROOFTOP MOUNTED

Contractors can apply for an Over-The-Counter (OTC) permit where the PV system meets the requirements listed in this Checklist. All project plans and supporting documentation must be provided on site for the inspector.

--------TO BE COMPLETED BY APPLICANT-------

1 Project Information

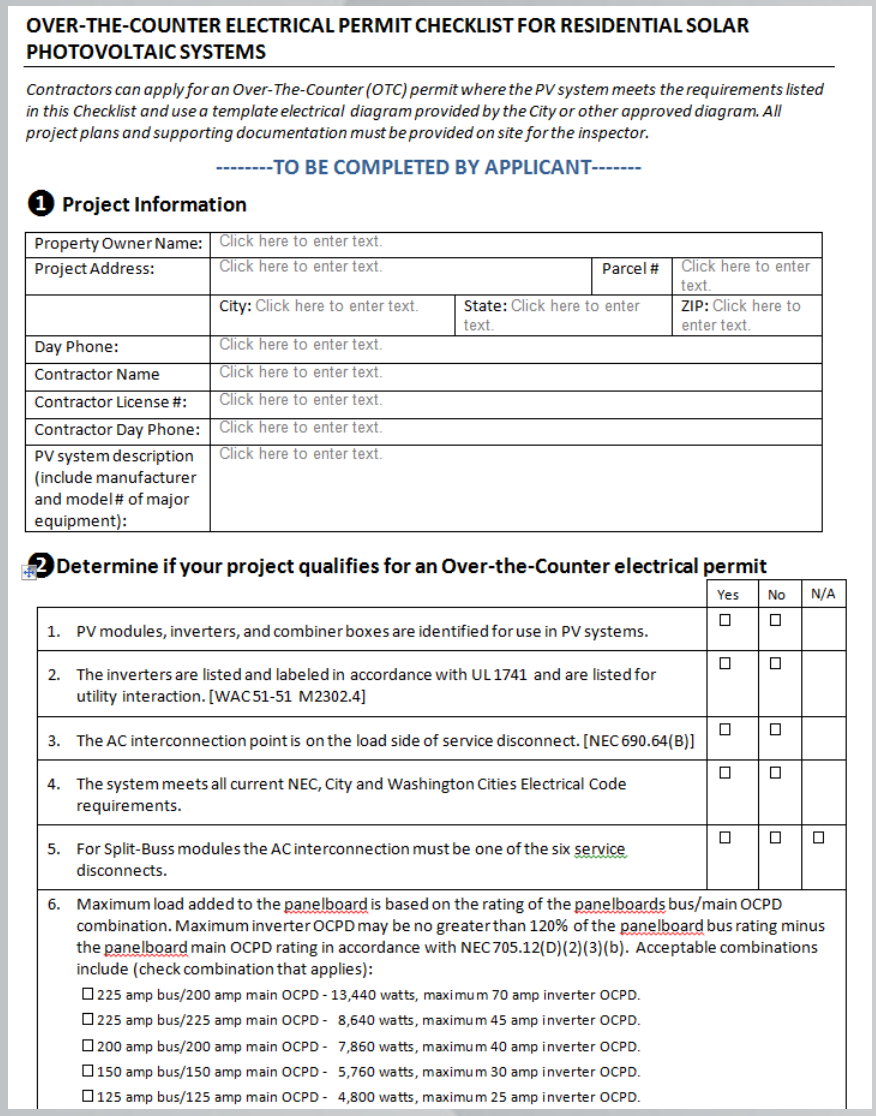
Property Owner Name:	Click here to enter text.		
Project Address:	Click here to enter text.	Parcel #	Click here to enter text.
	City: Click here to enter text.	State: Click here to enter text.	ZIP: Click here to enter text.
Day Phone:	Click here to enter text.		
Contractor Name	Click here to enter text.		
Contractor License #:	Click here to enter text.		
Contractor Day Phone:	Click here to enter text.		
PV system description (include manufacturer and model # of major equipment):	Click here to enter text.		

2 Determine if your project qualifies for expedited permitting:

	Yes	No
1. PV system is designed and proposed for a detached one- or two-family dwelling or townhouse not more than three stories above grade or detached accessory structure that is code compliant to setbacks and height, or code allows expansion of nonconformity for solar modules. [IRC 101.2]	☐	☐
2. Modules on pitched roofs do not exceed the highest point of the roof unless approved by the local jurisdiction.	☐	☐
3. Rooftop is made from lightweight material such as a single layer of composition shingles, metal roofing, lightweight masonry, or cedar shingles.	☐	☐
4. The installation shall comply with the manufacturer's instructions. [IRC M2302.2]	☐	☐
5. The installation shall meet the requirements of NFPA 70 National Electric Code, and all required electrical permit(s) must be obtained from the Authority Having Jurisdiction to administer the electrical code. [IRC M2302.2]	☐	☐
6. The installation shall meet the requirements of the International Fire Code as amended by WA State. [IRC M2302.2]	☐	☐
7. The PV system is designed for the wind speed of the local area, and will be installed per the manufacturer's specifications. [IRC M2302.2.1(1)]	☐	☐
8. The ground snow load does not exceed 70 pounds per square foot. [IRC M2302.2.1(2)]	☐	☐
9. Total dead load of modules, supports, mountings, raceways and all other appurtenances weigh no more than four pounds per square foot. [IRC M2302.2.1(3)] Enter total dead load of system (lbs/ft²): Click here to enter text.	☐	☐
10. To address uplift, modules are mounted no higher than 18" above the surface of the	☐	☐

Checklists

Electrical Permit Checklist



OVER-THE-COUNTER ELECTRICAL PERMIT CHECKLIST FOR RESIDENTIAL SOLAR PHOTOVOLTAIC SYSTEMS

Contractors can apply for an Over-The-Counter (OTC) permit where the PV system meets the requirements listed in this Checklist and use a template electrical diagram provided by the City or other approved diagram. All project plans and supporting documentation must be provided on site for the inspector.

--------TO BE COMPLETED BY APPLICANT-------

1 Project Information

Property Owner Name:	Click here to enter text.		
Project Address:	Click here to enter text.	Parcel #	Click here to enter text.
	City: Click here to enter text.	State: Click here to enter text.	ZIP: Click here to enter text.
Day Phone:	Click here to enter text.		
Contractor Name	Click here to enter text.		
Contractor License #:	Click here to enter text.		
Contractor Day Phone:	Click here to enter text.		
PV system description (include manufacturer and model # of major equipment):	Click here to enter text.		

2 Determine if your project qualifies for an Over-the-Counter electrical permit

	Yes	No	N/A
1. PV modules, inverters, and combiner boxes are identified for use in PV systems.	☐	☐	
2. The inverters are listed and labeled in accordance with UL 1741 and are listed for utility interaction. [WAC 51-51 M2302.4]	☐	☐	
3. The AC interconnection point is on the load side of service disconnect. [NEC 690.64(B)]	☐	☐	
4. The system meets all current NEC, City and Washington Cities Electrical Code requirements.	☐	☐	
5. For Split-Buss modules the AC interconnection must be one of the six service disconnects.	☐	☐	☐
6. Maximum load added to the panelboard is based on the rating of the panelboards bus/main OCPD combination. Maximum inverter OCPD may be no greater than 120% of the panelboard bus rating minus the panelboard main OCPD rating in accordance with NEC 705.12(D)(2)(3)(b). Acceptable combinations include (check combination that applies):			
☐ 225 amp bus/200 amp main OCPD - 13,440 watts, maximum 70 amp inverter OCPD.			
☐ 225 amp bus/225 amp main OCPD - 8,640 watts, maximum 45 amp inverter OCPD.			
☐ 200 amp bus/200 amp main OCPD - 7,860 watts, maximum 40 amp inverter OCPD.			
☐ 150 amp bus/150 amp main OCPD - 5,760 watts, maximum 30 amp inverter OCPD.			
☐ 125 amp bus/125 amp main OCPD - 4,800 watts, maximum 25 amp inverter OCPD.			

Table 406.2 Energy Credits

- All new construction must develop credits from Table 406.2 based on size of dwelling unit.

Table 406.2 Energy Credits

Required Credits

- Houses < 1500 ft^2 — 0.5
  - 300 ft^2 max. glazing
  - Additions 750 ft^2
- Houses ≥ 1500 ft^2 – 5,000 ft^2 — 1.5
- Houses > 5,000 ft^2 — 2.5

Table 406.2 Energy Credits

- Improvements to building envelope
  - Credits range from .5 to 2.0 credits
- Tighter building with efficient ventilation
  - Credits range from .5 to 1.5 credits
- High Efficiency HVAC
  - Credits range from .5 to 2.0 credits
- Mini Split
  - 1 credit
- All HVAC equipment and ducts inside
  - 1 credit

Table 406.2 Energy Credits

- Efficient water heating
  - Credits range from .5 to 1.5 credits
- Renewable electric energy
  - Credits range from .5 to 3.0 credits

WASHINGTON STATE UNIVERSITY

EXTENSION ENERGY PROGRAM

www.energy.wsu.edu