

Prescriptive Energy Code Compliance for All Climate Zones in Washington

Project Information

Contact Information

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This project will use the requirements of the Prescriptive Path below and incorporate 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 ^p | n/a | 0.30 |
| Skylight U-Factor | n/a | 0.50 |
| Glazed Fenestration SHGC ^{d,e} | n/a | n/a |
| Ceiling ^k | 49 ^j | 0.026 |
| Wood Frame Wall ^{g,m,n} | 21 int | 0.056 |
| Mass Wall R-Value ^l | 21/21 ⁿ | 0.056 |
| Floor | 30 ^g | 0.029 |
| Below Grade Wall ^{c,m} | 10/15/21 int + TB | 0.042 |
| Slab ^o 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 a residential building shall comply with sufficient options from Table R406.2 so as to achieve the following minimum number of credits:

- 1. Small Dwelling Unit: 1.5 credits**
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 greater than 500 square feet of heated floor area but less than 1500 square feet.
- 2. Medium Dwelling Unit: 3.5 credits**
All dwelling units that are not included in #1 or #3. **Exception:** Dwelling units serving R-2 occupancies shall require 2.5 credits.
- 3. Large Dwelling Unit: 4.5 credits**
Dwelling units exceeding 5000 square feet of conditioned floor area.
- 4. Additions less than 500 square feet: .5 credits**

Table R406.2 Summary

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

*Please refer to Table R406.2 for complete option descriptions

Table R402.1.1 Footnotes

For SI: 1 foot = 304.8 mm, ci = continuous insulation, int = intermediate framing.

^a R-values are minimums. U-factors and SHGC are maximums. When insulation is installed in a cavity which is less than the label or design thickness of the insulation, the compressed R-value of the insulation from Appendix Table A101.4 shall not be less than the R-value specified in the table.

^b The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

^c "10/15/21.+TB" means R-10 continuous insulation on the exterior of the wall, or R-15 on the continuous insulation on the interior of the wall, or R-21 cavity insulation plus a thermal break between the slab and the basement wall at the interior of the basement wall. "10/15/21.+TB" shall be permitted to be met with R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the wall. "10/13" means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation at the interior of the basement wall. "TB" means thermal break between floor slab and basement wall.

^d R-10 continuous insulation is required under heated slab on grade floors. See R402.2.9.1.

^e There are no SHGC requirements in the Marine Zone.

^f Reserved.

^g Reserved.

^h Reserved.

ⁱ The second R-value applies when more than half the insulation is on the interior of the mass wall.

^j Reserved.

^k For single rafter- or joist-vaulted ceilings, the insulation may be reduced to R-38.

^l Reserved.

^m Int. (intermediate framing) denotes standard framing 16 inches on center with headers insulated with a minimum of R-10 insulation.

Table R402.1.3 Footnote

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

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](#)

Select closest city

Design Temperature Difference (ΔT)

$\Delta T = \text{Indoor (70 degrees)} - \text{Outdoor Design Temp}$

Area of Building

Conditioned Floor Area

[Instructions](#)

Conditioned Floor Area (sq ft)

Average Ceiling Height

[Instructions](#)

Average Ceiling Height (ft)

Conditioned Volume

Glazing and Doors

[Instructions](#)

U-Factor X Area = UA
0.30 ---

U-Factor X Area = UA
0.50 ---

Skylights

[Instructions](#)

Insulation

Attic

[Instructions](#)

Select R-Value

U-Factor X Area = UA
No selection ---

Single Rafter or Joist Vaulted Ceilings

[Instructions](#)

Select R-Value

U-Factor X Area = UA
No selection ---

Above Grade Walls (see Figure 1)

[Instructions](#)

Select R-Value

U-Factor X Area = UA
No selection ---

Floors

[Instructions](#)

Select R-Value

U-Factor X Area = UA
No selection ---

Below Grade Walls (see Figure 1)

[Instructions](#)

Select R-value

U-Factor X Area = UA
No selection ---

Slab Below Grade (see Figure 1)

[Instructions](#)

Select conditioning

F-Factor X Length = UA
No selection ---

Slab on Grade (see Figure 1)

[Instructions](#)

Select R-Value

F-Factor X Length = UA
No selection ---

Location of Ducts

[Instructions](#)

Select Location of Ducts

Duct Leakage Coefficient

Sum of UA

Envelope Heat Load

$\text{Sum of UA} \times \Delta T$

Air Leakage Heat Load

$\text{Volume} \times 0.6 \times \Delta T \times .018$

Building Design Heat Load

$\text{Air Leakage} + \text{Envelope Heat Loss}$

Building and Duct Heat Load

$\text{Ducts in unconditioned space: Sum of Building Heat Loss} \times 1.10$

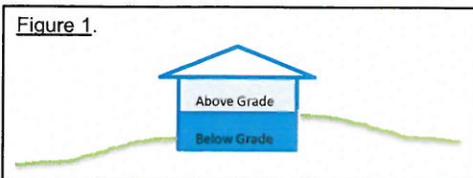
$\text{Ducts in conditioned space: Sum of Building Heat Loss} \times 1$

Maximum Heat Equipment Output

$\text{Building and Duct Heat Loss} \times 1.40$ for Forced Air Furnace

$\text{Building and Duct Heat Loss} \times 1.25$ for Heat Pump

Figure 1.



Additional Energy Efficiency Requirements

As per Section R406 of the Washington State Energy Code 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:

| |
|---|
| <p>Small Dwelling Unit: <u>1.5 Credits</u> Dwelling units less than 1,500 square feet in conditioned floor area with less than 300 square feet of fenestration area. Additions to existing building that are greater than 500 square feet of heated floor area but less than 1500 square feet.</p> <p>Medium Dwelling Unit: <u>3.5 Credits</u> All dwelling units not included in #1 or #3. Exception: Dwellings unit serving R-2 occupancies require 2.5 credits.</p> <p>Large Dwelling Unit: <u>4.5 Credits</u> Dwelling units exceeding 5,000 square feet of conditioned floor area.</p> <p>Additions less than 500 square feet: <u>0.5 Credits</u></p> |
|---|

**ENERGY CREDITS
TABLE 406.2**

| OPTION | CREDIT DESCRIPTION | CREDIT(S) |
|--------|---|-----------|
| 1a | <p>EFFICIENT BUILDING ENVELOPE 1a: Prescriptive compliance is based on Table R402.1.1 with the following modifications: Fenestration U = 0.28 Floor R-38 Slab on grade R-10 perimeter and under entire slab Below grade slab R-10 perimeter and under entire slab or Compliance based on Section R402.1.4: Reduce the Total UA by 5%.</p> | 0.5 |
| 1b | <p>EFFICIENT BUILDING ENVELOPE 1b: Prescriptive compliance is based on Table R402.1.1 with the following modifications: Fenestration U = 0.25 Wall R-21 plus R-4 Floor R-38 Basement wall R-21 int plus R-5 ci Slab on grade R-10 perimeter and under entire slab Below grade slab R-10 perimeter and under entire slab or Compliance based on Section R402.1.4: Reduce the Total UA by 15%.</p> | 1.0 |
| 1c | <p>EFFICIENT BUILDING ENVELOPE 1c: Prescriptive compliance is based on Table R402.1.1 with the following modifications: Fenestration U = 0.22 Ceiling and single-rafter or joist-vaulted R-49 advanced Wood frame wall R-21 int plus R-12 ci Floor R-38 Basement wall R-21 int plus R-12 ci Slab on grade R-10 perimeter and under entire slab Below grade slab R-10 perimeter and under entire slab or Compliance based on Section R402.1.4: Reduce the Total UA by 30%.</p> | 2.0 |
| 1d | <p>EFFICIENT BUILDING ENVELOPE 1d: Prescriptive compliance is based on Table 402.1.1 with the following modifications: Vertical fenestration U = 0.24</p> | 0.5 |

| | | |
|-----------------|---|-----|
| 2a | <p>AIR LEAKAGE CONTROL AND EFFICIENT VENTILATION 2a:</p> <p>Compliance based on R402.4.1.2: Reduce the tested air leakage to 3.0 air changes per hour maximum</p> <p>and</p> <p>All whole house ventilation requirements as determined by Section M1507.3 of the International Residential Code shall be met with a high efficiency fan (maximum 0.35 watts/cfm), not interlocked with the furnace fan. Ventilation systems using a furnace including an ECM motor are allowed, provided that they are controlled to operate at low speed in ventilation only mode.</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the maximum tested building air leakage and shall show the ventilation system.</p> | 0.5 |
| 2b | <p>AIR LEAKAGE CONTROL AND EFFICIENT VENTILATION 2b:</p> <p>AIR LEAKAGE CONTROL AND EFFICIENT VENTILATION 2b: Compliance based on Section R402.4.1.2: Reduce the tested air leakage to 2.0 air changes per hour maximum</p> <p>and</p> <p>All whole house ventilation requirements as determined by Section M1507.3 of the International Residential Code shall be met with a heat recovery ventilation system with minimum sensible heat recovery efficiency of 0.70.</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the maximum tested building air leakage and shall show the heat recovery ventilation system.</p> | 1.0 |
| 2c | <p>AIR LEAKAGE CONTROL AND EFFICIENT VENTILATION 2c:</p> <p>Compliance based on Section R402.4.1.2: Reduce the tested air leakage to 1.5 air changes per hour maximum</p> <p>and</p> <p>All whole house ventilation requirements as determined by Section M1507.3 of the International Residential Code shall be met with a heat recovery ventilation system with minimum sensible heat recovery efficiency of 0.85.</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the maximum tested building air leakage and shall show the heat recovery ventilation system.</p> | 1.5 |
| 3a ^b | <p>HIGH EFFICIENCY HVAC EQUIPMENT 3a:</p> <p>Gas, propane or oil-fired furnace with minimum AFUE of 94%, or Gas, propane or oil-fired boiler with minimum AFUE of 92%</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the heating equipment type and the minimum equipment efficiency.</p> | 1.0 |
| 3b ^b | <p>HIGH EFFICIENCY HVAC EQUIPMENT 3b:</p> <p>Air-source heat pump with minimum HSPF of 9.0</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the heating equipment type and the minimum equipment efficiency.</p> | 1.0 |
| 3c ^b | <p>HIGH EFFICIENCY HVAC EQUIPMENT 3c:</p> <p>Closed-loop ground source heat pump; with a minimum COP of 3.3</p> <p>or</p> <p>Open loop water source heat pump with a maximum pumping hydraulic head of 150 feet and minimum COP of 3.6</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the heating equipment type and the minimum equipment efficiency.</p> | 1.5 |
| 3d ^b | <p>HIGH EFFICIENCY HVAC EQUIPMENT 3d:</p> <p>DUCTLESS SPLIT SYSTEM HEAT PUMPS, ZONAL CONTROL: In homes where the primary space heating system is zonal electric heating, a ductless heat pump system shall be installed and provide heating to at least one zone of the housing unit.</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the heating equipment type and the minimum equipment efficiency.</p> | 1.0 |

| | | |
|----|--|-----|
| 4 | <p>HIGH EFFICIENCY HVAC DISTRIBUTION SYSTEM:</p> <p>All heating and cooling system components installed inside the conditioned space. This includes all equipment and distribution system components such as forced air ducts, hydronic piping, hydronic floor heating loop, convectors and radiators. All combustion equipment shall be direct vent or sealed combustion.</p> <p>For forced air ducts: A maximum of 10 linear feet of return ducts and 5 linear feet of supply ducts may be located outside the conditioned space. All metallic ducts located outside the conditioned space must have both transverse and longitudinal joints sealed with mastic. If flex ducts are used, they cannot contain splices. Flex duct connections must be made with nylon straps and installed using a plastic strapping tensioning tool. Ducts located outside the conditioned space must be insulated to a minimum of R-8. Locating system components in conditioned crawl spaces is not permitted under this option.</p> <p>Electric resistance heat is not permitted under this option.</p> <p>Direct combustion heating equipment with AFUE less than 80% is not permitted under this option.</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the heating equipment type and shall show the location of the heating and cooling equipment and all the ductwork.</p> | 1.0 |
| 5a | <p>EFFICIENT WATER HEATING 5a:</p> <p>All showerhead and kitchen sink faucets installed in the house shall be rated at 1.75 GPM or less. All other lavatory faucets shall be rated at 1.0 GPM or less.^c</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the maximum flow rates for all showerheads, kitchen sink faucets, and other lavatory faucets.</p> | 0.5 |
| 5b | <p>EFFICIENT WATER HEATING 5b:</p> <p>Water heating system shall include one of the following: Gas, propane or oil water heater with a minimum EF of 0.74 or Water heater heated by ground source heat pump meeting the requirements of Option 3c. or For R-2 occupancy, a central heat pump water heater with an EF greater than 2.0 that would supply DHW to all the units through a central water loop insulated with R-8 minimum pipe insulation.</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the water heater equipment type and the minimum equipment efficiency.</p> | 1.0 |
| 5c | <p>EFFICIENT WATER HEATING 5c:</p> <p>Water heating system shall include one of the following: Gas, propane or oil water heater with a minimum EF of 0.91 or Solar water heating supplementing a minimum standard water heater. Solar water heating will provide a rated minimum savings of 85 therms or 2000 kWh based on the Solar Rating and Certification Corporation (SRCC) Annual Performance of OG-300 Certified Solar Water Heating Systems or Electric heat pump water heater with a minimum EF of 2.0 and meeting the standards of NEEA's Northern Climate Specifications for Heat Pump Water Heaters.</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the water heater equipment type and the minimum equipment efficiency and, for solar water heating systems, the calculation of the minimum energy savings.</p> | 1.5 |
| 5d | <p>EFFICIENT WATER HEATING 5d:</p> <p>A drain water heat recovery unit(s) shall be installed, which captures waste water heat from all showers, and has a minimum efficiency of 40% if installed for equal flow or a minimum efficiency of 52% if installed for unequal flow. Such units shall be rated in accordance with CSA B55.1 and be so labeled.</p> <p>To qualify to claim this credit, the building permit drawings shall include a plumbing diagram that specifies the drain water heat recovery units and the plumbing layout needed to install it and labels or other documentation shall be provided that demonstrates that the unit complies with the standard.</p> | 0.5 |

| | | |
|---|---|-----|
| 6 | <p>RENEWABLE ELECTRIC ENERGY:</p> <p>For each 1200 kWh of electrical generation provided annually by on-site wind or solar equipment a 0.5 credit shall be allowed, up to 3 credits. Generation shall be calculated as follows:</p> <p>For solar electric systems, the design shall be demonstrated to meet this requirement using the National Renewable Energy Laboratory calculator PVWATTS. Documentation noting solar access shall be included on the plans.</p> <p>For wind generation projects designs shall document annual power generation based on the following factors:</p> <p>The wind turbine power curve; average annual wind speed at the site; frequency distribution of the wind speed at the site and height of the tower.</p> <p>To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall show the photovoltaic or wind turbine equipment type, provide documentation of solar and wind access, and include a calculation of the minimum annual energy power production.</p> | 0.5 |
|---|---|-----|

- a. Projects using this option may not use Option 1a, 1b or 1c.
- b. Projects may only include credit from one space heating option, 3a, 3b,3c or 3d. When a housing unit has two pieces of equipment (i.e., two furnaces) both must meet the standard to receive the credit.
- c. **Plumbing Fixtures Flow Ratings.** Low flow plumbing fixtures (water closets and urinals) and fittings (faucets and showerheads) shall comply with the following requirements:
 - 1. Residential bathroom lavatory sink faucets: Maximum flow rate - 3.8 L/min (1.0 gal/min) when tested in accordance with ASME A112.18.1/CSA B125.1.
 - 2. Residential kitchen faucets: Maximum flow rate - 6.6 L/min (1.75 gal/min) when tested in accordance with ASME A112.18.1/CSA B125.1.
 - 3. Residential showerheads: Maximum flow rate - 6.6 L/min (1.75 gal/min) when tested in accordance with ASME A112.18.1/CSA B125.1.

Residential Building Air Leakage Test (Blower Door Test) Results

Permit #: _____

House address or lot number: _____

City: _____

Zip: _____

Cond. Floor Area (ft²): _____

Age of house: _____

Source (circle one):

Plans

Estimated

Measured

Results shall be reported as Air Changes per Hour at 50 Pascals (ACH₅₀) and shall be calculated as follows:

$$ACH_{50} = (CFM_{50} \times 60) / \text{Volume}$$

Where:

CFM₅₀ = Blower door fan flow at 50 Pascal pressure difference

Volume = Conditioned Floor Area of the housing unit x ceiling height

Blower Door Test Result: _____ ACH₅₀
_____ CFM@50Pa

Ring (circle one if applicable):

Open

A

B

C

Blower Door Fan Location: _____ Weather Conditions: _____

I certify that these blower door results are accurate and determined using standard industry protocol.

Company Name: _____ Technician: _____

Technician Signature: _____ Date: _____ Phone Number: _____

2015 Washington State Energy Code reference:

R402.4.1.2 Testing. The building or dwelling unit shall be tested and verified as having an air leakage rate of not exceeding 5 air changes per hour. Testing shall be conducted with a blower door at a pressure of 0.2 inches w.g. (50 Pascals). Where required by the *code official*, testing shall be conducted by an *approved* third party. **A written report of the results of the test shall be signed by the party conducting the test and provided to the code official.** Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope*. Once visual inspection has confirmed sealing (see Table R402.4.1.1), operable windows and doors manufactured by *small business* shall be permitted to be sealed off at the frame prior to the test.

