

2018 Washington State Energy Code – Residential
 Prescriptive Energy Code Compliance for All Climate Zones in Washington
 Single Family – New & Additions (effective February 1, 2021)

Version 1.2

These requirements apply to all IRC building types, including detached one- and two-family dwellings and multiple single-family dwellings (townhouses).

Project Information
Mahramnia 2.0

Contact Information
Chris Luthi

Instructions: This single-family project will use the requirements of the Prescriptive Path below and incorporate the minimum values listed. Based on the size of the structure, the appropriate number of additional credits are checked as chosen by the permit applicant.

Provide all information from the following tables as building permit drawings: Table R402.1 - Insulation and Fenestration Requirements by Component, Table R406.2 - Fuel Normalization Credits and 406.3 - Energy Credits.

Authorized Representative	Chris Luthi	Date	02/27/2023
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All Climate Zones (Table R402.1.1)		
	R-Value ^a	U-Factor ^a
Fenestration U-Factor ^b	n/a	0.30
Skylight U-Factor ^b	n/a	0.50
Glazed Fenestration SHGC ^{b,e}	n/a	n/a
Ceiling ^e	49	0.026
Wood Frame Wall ^{g,h}	21 int	0.056
Floor	30	0.029
Below Grade Wall ^{c,h}	10/15/21 int + TB	0.042
Slab ^{d,f} R-Value & Depth	10, 2 ft	n/a
a	R-values are minimums. U-factors and SHGC are maximums. When insulation is installed in a cavity that 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.	
c	"10/15/21 +5TB" means R-10 continuous insulation on the exterior of the wall, or R-15 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 +5TB" 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. "5TB" means R-5 thermal break between floor slab and basement wall.	
d	R-10 continuous insulation is required under heated slab on grade floors. See Section R402.2.9.1.	
e	For single rafter- or joist-vaulted ceilings, the insulation may be reduced to R-38 if the full insulation depth extends over the top plate of the exterior wall.	
f	R-7.5 continuous insulation installed over an existing slab is deemed to be equivalent to the required perimeter slab insulation when applied to existing slabs complying with Section R503.1.1. If foam plastic is used, it shall meet the requirements for thermal barriers protecting foam plastics.	
g	For log structures developed in compliance with Standard ICC 400, log walls shall meet the requirements for <i>climate zone 5</i> of ICC 400.	
h	Int. (intermediate framing) denotes framing and insulation as described in Section A103.2.2 including standard framing 16 inches on center, 78% of the wall cavity insulated and headers insulated with a minimum of R-10 insulation.	

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Each dwelling unit *in a residential building* shall comply with sufficient options from Table R406.2 (fuel normalization credits) and Table 406.3 (energy credits) to achieve the following minimum number of credits. To claim this credit, the building permit drawings shall specify the option selected and the maximum tested building air leakage, and show the qualifying ventilation system and its control sequence of operation.

1. **Small Dwelling Unit: 3 credits**
 Dwelling units less than 1,500 sf in conditioned floor area with less than 300 sf of fenestration area.
 Additions to existing building that are greater than 500 sf of heated floor area but less than 1,500 sf.
2. **Medium Dwelling Unit: 6 credits**
 All dwelling units that are not included in #1 or #3
3. **Large Dwelling Unit: 7 credits**
 Dwelling units exceeding 5,000 sf of conditioned floor area
4. **Additions less than 500 square feet: 1.5 credits**
All other additions shall meet 1-3 above

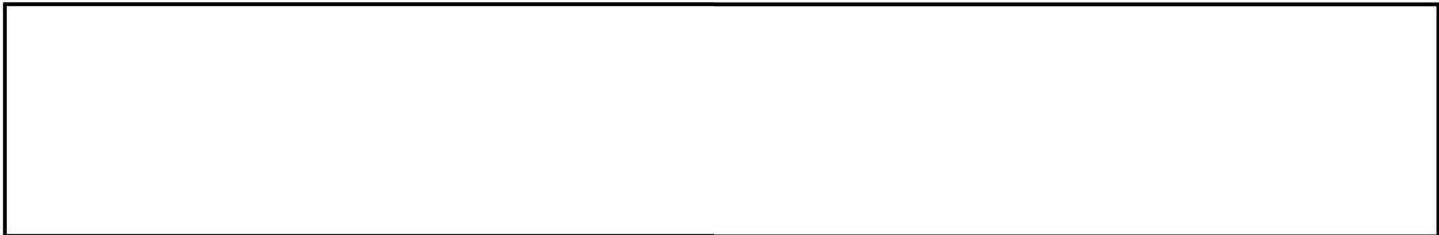
Before selecting your credits on this Summary table, review the details in Table 406.3 (Single Family), on page 4.

Summary of Table R406.2 and 406.3				
Heating Options	Fuel Normalization Descriptions	Credits - select ONE heating option		User Notes
1	Combustion heating minimum NAECA ^b	0.0	<input type="checkbox"/>	
2	Heat pump ^c	1.0	<input checked="" type="checkbox"/>	
3	Electric resistance heat only - furnace or zonal	-1.0	<input type="checkbox"/>	
4	DHP with zonal electric resistance per option 3.4	0.5	<input type="checkbox"/>	
5	All other heating systems	-1.0	<input type="checkbox"/>	
Energy Options	Energy Credit Option Descriptions	Credits - select ONE energy option from each category ^d		User Notes
1.1	Efficient Building Envelope	0.5	<input type="checkbox"/>	
1.2	Efficient Building Envelope	1.0	<input type="checkbox"/>	
1.3	Efficient Building Envelope	0.5	<input type="checkbox"/>	
1.4	Efficient Building Envelope	1.0	<input type="checkbox"/>	
1.5	Efficient Building Envelope	2.0	<input type="checkbox"/>	
1.6	Efficient Building Envelope	3.0	<input type="checkbox"/>	
1.7	Efficient Building Envelope <input type="checkbox"/>	0.5	<input type="checkbox"/>	
2.1	Air Leakage Control and Efficient Ventilation	0.5	<input type="checkbox"/>	
2.2	Air Leakage Control and Efficient Ventilation	1.0	<input type="checkbox"/>	
2.3	Air Leakage Control and Efficient Ventilation	1.5	<input type="checkbox"/>	
2.4	Air Leakage Control and Efficient Ventilation <input type="checkbox"/>	2.0	<input type="checkbox"/>	
3.1 ^a	High Efficiency HVAC	1.0	<input type="checkbox"/>	
3.2	High Efficiency HVAC	1.0	<input type="checkbox"/>	
3.3 ^a	High Efficiency HVAC	1.5	<input type="checkbox"/>	
3.4	High Efficiency HVAC	1.5	<input type="checkbox"/>	
3.5.1	High Efficiency HVAC	1.5	<input type="checkbox"/>	
3.5.2	High Efficiency HVAC	1.5	<input type="checkbox"/>	
3.6 ^a	High Efficiency HVAC <input type="checkbox"/>	2.0	<input checked="" type="checkbox"/>	
4.1	High Efficiency HVAC Distribution System	0.5	<input type="checkbox"/>	
4.2	High Efficiency HVAC Distribution System <input type="checkbox"/>	1.0	<input type="checkbox"/>	

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Summary of Table R406.2 (cont.)				
Energy Options	Energy Credit Option Descriptions (cont.)	Credits - select ONE energy option from each category ^d		User Notes
5.1 ^d	Efficient Water Heating	0.5	<input type="checkbox"/>	
5.2	Efficient Water Heating	0.5	<input type="checkbox"/>	
5.3	Efficient Water Heating	1.0	<input type="checkbox"/>	
5.4	Efficient Water Heating	1.5	<input type="checkbox"/>	
5.5	Efficient Water Heating	2.0	<input type="checkbox"/>	
5.6	Efficient Water Heating <input type="checkbox"/>	2.5	<input type="checkbox"/>	
6.1 ^e	Renewable Electric Energy (3 credits max)	1.0	<input type="checkbox"/>	
7.1	Appliance Package	0.5	<input type="checkbox"/>	
Total Credits		3.0		<input type="button" value="Calculate Total"/> <input type="button" value="Clear Form"/>

- a. An alternative heating source sized at a maximum of 0.5 W/sf (equivalent) of heated floor area or 500 W, whichever is bigger, may be installed in the dwelling unit.
- b. Equipment listed in Table C403.3.2(4) or C403.3.2(5)
- c. Equipment listed in Table C403.3.2(1) or C403.3.2(2)
- d. You cannot select more than one option from any category EXCEPT in category 5. Option 5.1 may be combined with options 5.2 through 5.6. See Table 406.3.**
- e. 1.0 credit for each 1,200 kWh of electrical generation provided annually, up to 3 credits max. See the complete Table R406.2 for all requirements and option descriptions.
- f. Use the single radiobutton in the upper right of the second column to deselect radiobuttons in that group.



Window, Skylight and Door Schedule

Project Information

Mahraminia 2.0

Contact Information

	Ref.	U-factor	Width		Height		Area	UA
			Qt.	Feet ^{Inch}	Feet ^{Inch}	Feet ^{Inch}		
Exempt Swinging Door (24 sq. ft. max.)							0.0	0.00
Exempt Glazed Fenestration (15 sq. ft. max.)							0.0	0.00

Vertical Fenestration (Windows and doors)

Component Description	Ref.	U-factor	Qt.	Width		Height		Area	UA
				Feet ^{Inch}	Feet ^{Inch}	Feet ^{Inch}	Feet ^{Inch}		
entry		0.30	1	4 ⁰	8 ⁰			32.0	9.60
stairs		0.30	1	2 ⁰	8 ⁴			16.7	5.00
mud		0.30	1	3 ⁰	5 ⁰			15.0	4.50
mud		0.30	1	3 ⁰	3 ⁵			10.3	3.08
kitchen		0.30	1	3 ⁰	5 ⁰			15.0	4.50
kitchen		0.30	2	8 ⁰	3 ⁵			54.7	16.40
kitchen		0.30	1	8 ⁰	8 ⁰			64.0	19.20
liv		0.30	2	8 ⁰	3 ⁵			54.7	16.40
liv		0.30	1	16 ⁰	8 ⁰			128.0	38.40
mbed		0.30	2	3 ²	8 ⁰			50.7	15.20
mbed		0.30	4	3 ¹¹	8 ⁰			125.3	37.60
mbath		0.30	1	7 ⁰	5 ⁶			38.5	11.55
mbath		0.30	1	3 ⁸	2 ⁰			7.3	2.20
m clo		0.30	2	3 ⁰	2 ⁰			12.0	3.60
office		0.30	1	3 ⁰	3 ⁰			9.0	2.70
office		0.30	1	8 ⁰	5 ⁰			40.0	12.00
office		0.30	1	3 ⁰	5 ⁰			15.0	4.50
stairs		0.30	5	3 ⁰	3 ⁰			45.0	13.50
bed1		0.30	1	3 ²	10 ⁰			31.7	9.50
bed1		0.30	3	3 ¹¹	10 ⁰			117.5	35.25
b1+2bath		0.30	1	2 ⁸	2 ⁰			5.3	1.60
b1+2bath		0.30	1	4 ^{6.5}	2 ⁰			9.1	2.73
b2		0.30	1	6 ⁰	5 ⁰			30.0	9.00
b2		0.30	1	3 ⁰	5 ⁰			15.0	4.50
b3		0.30	1	6 ⁰	2 ⁹			16.5	4.95
b3		0.30	1	6 ⁰	5 ⁰			30.0	9.00
b3		0.30	1	8 ⁰	5 ⁰			40.0	12.00
b3		0.30	1	8 ⁰	2 ⁹			22.0	6.60
b3		0.30	1	3 ⁰	3 ⁰			9.0	2.70
b4		0.30	1	6 ⁰	3 ¹⁰			23.0	6.90
rec		0.30	1	8 ⁰	6 ¹⁰			54.7	16.40
rec		0.30	1	6 ⁰	3 ¹⁰			23.0	6.90
b5bath		0.30	1	3 ⁰	2 ⁰			6.0	1.80

b5		0.30
b5		0.30

1	3	2	6	10
1	6	0	3	10

21.6	6.49
23.0	6.90
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

Sum of Vertical Fenestration Area and UA
Vertical Fenestration Area Weighted U = UA/Area

1210.5	363.14
	0.30

Overhead Glazing (Skylights)

Component Description	Ref.	U-factor
dining		0.50

Qt.	Width		Height	
	Feet	Inch	Feet	Inch
3	2	0	4	0

Area	UA
24.0	12.00
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 Overhead Glazing Area and UA
Overhead Glazing Area Weighted U = UA/Area

24.0	12.00
	0.50

Total Sum of Fenestration Area and UA (for heating system sizing calculations)

1234.5	375.14
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Simple Heating System Size: Washington State

This heating system sizing calculator is based on the Prescriptive Requirements of the 2018 Washington State Energy Code (WSEC) and ACCA Manuals J and S. This tool will calculate heating loads only. ACCA procedures for sizing cooling systems should be used to determine cooling loads.

Please complete 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 contact the WSU Energy Program at energycode@energy.wsu.edu or (360) 956-2042 for assistance.

Project Information

Mahramnia 2.0

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](#)

Mercer Island

Design Temperature Difference (ΔT)

45

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

Area of Building

Conditioned Floor Area

[Instructions](#)

Conditioned Floor Area (sq ft)

4,624

Average Ceiling Height

[Instructions](#)

Average Ceiling Height (ft)

9.0

Conditioned Volume

41,616

Glazing and Doors

[Instructions](#)

U-0.30

U-Factor X Area = UA
0.300 X 1,211 = 363.15

Skylights

[Instructions](#)

U-Factor X Area = UA
0.50 X 24 = 12.00

Insulation

Attic

[Instructions](#)

R-49

U-Factor X Area = UA
0.026 X 2,014 = 52.36

Single Rafter or Joist Vaulted Ceilings

[Instructions](#)

R-38 Vented

U-Factor X Area = UA
0.027 X [] = []

Above Grade Walls (see Figure 1)

[Instructions](#)

Select R-Value

U-Factor X Area = UA
No selection X 4,532 = []

Floors

[Instructions](#)

No Floors above unconditioned spaces.

U-Factor X Area = UA
--- X 0 = []

Below Grade Walls (see Figure 1)

[Instructions](#)

R-21 Interior

U-Factor X Area = UA
0.042 X 815 = 34.23

Slab Below Grade (see Figure 1)

[Instructions](#)

R-5 Thermal Break at slab edge

F-Factor X Length = UA
0.570 X 172 = 98.04

Slab on Grade (see Figure 1)

[Instructions](#)

R-10 Fully Insulated

F-Factor X Length = UA
0.360 X [] = []

Location of Ducts

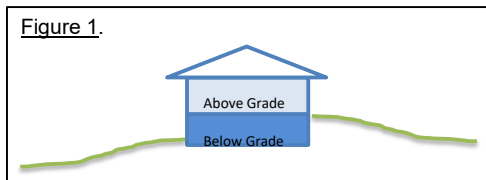
[Instructions](#)

No Ducts

Duct Leakage Coefficient

1.00

Figure 1.



Sum of UA	559.78
Envelope Heat Load	25,190 Btu / Hour
<i>Sum of UA x ΔT</i>	
Air Leakage Heat Load	20,225 Btu / Hour
<i>Volume x 0.6 x ΔT x 0.018</i>	
Building Design Heat Load	45,416 Btu / Hour
<i>Air leakage + envelope heat loss</i>	
Building and Duct Heat Load	45,416 Btu / Hour
<i>Ducts in unconditioned space: sum of building heat loss x 1.10</i>	
<i>Ducts in conditioned space: sum of building heat loss x 1</i>	
Maximum Heat Equipment Output	56,770 Btu / Hour
<i>Building and duct heat loss x 1.40 for forced air furnace</i>	
<i>Building and duct heat loss x 1.25 for heat pump</i>	