

Project Information
Obrien Residence 9412 SE 33rd St Mercer Island, WA 98040
Contact Information
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Messages / Comments *	RESULT= PASS
<p>Note: Review required for custom entries: - Flat/Vaulted Ceilings</p> <p>UA Reduction = 11.3, Proposed UA is better than baseline by 1.4%</p> <p>Window area is 35% of floor area</p> <p>Whole House Mechanical Ventilation Airflow Rate: 106.25 CFM with Run Time Percent of 100%, Unbalanced, Distributed Maximum allowable total measured duct leakage: 158 CFM25</p>	

* Results assume your inputs are complete and correct. Results do not constitute an approval. Analysis should be reviewed by your AHJ.

ANALYSIS SET UP	
What code compliance pathway are you using?	U-Factor Compliance Path
Project Building Type?	New Construction
Occupancy Type?	R3 Single family dwellings and townhouses
Code Version?	WSEC 2021
Classification:	Medium Dwelling Unit -- 3947 sq. ft.
Baseline Description:	Code Baseline - Baseline and proposed window areas are equal.
About Your Selection:	Up to 15 sf exempt window and 24 sf exempt door allowable

RESULTS - Comparison of Baseline and Proposed Design **						
Component Performance, R occupancies			Baseline		Proposed Design	
	U *	Area	UA	U	Area	UA
Doors U =	0.300	36	10.8	0.300	36	10.8
Overhead Glazing U =	0.500	59	29.4	0.500	59	29.4
Vertical Glazing U =	0.300	1,390	417.1	0.300	1,390	417.1
Flat/Vaulted Ceilings U =	0.024	1,952	46.8	0.019	1,952	37.1
Wall (above grade) U =	0.056	3,678	206.0	0.054	3,678	198.6
Floors over Crawlspace U =	0.029	635	18.4	0.028	635	17.8
Slab on Grade F =	0.540	0	0.0		0	0.0
Below Grade Wall U =	0.040	661	26.4	0.038	661	25.1
Below Grade Slab F =	0.560	111	62.2	0.630	111	69.9
			* Values from Table R402.1.2 (Oct 2023)			
Baseline UA Total			817.2	Proposed UA Total		
Required Credits			8.0	Proposed Credits		
				1%		
				UA Reduction		
				11.3		
<p>If the Proposed UA ≤ the Target UA, and the Proposed Credits from Table 406 are ≥ those required in Section R406, then the home meets the WSEC.</p>						

** Results assume your inputs are complete and correct. Results do not constitute an approval. Analysis should be reviewed by your AHJ.

Table R406.2 Energy Equalization Credits					
System No.	Full Description	Select System Type	Fuel Normalization Credits (406.2)	Energy Credits (406.3)	Total Credits (406.2 & 406.3)
4	For heating system using a heat pump that meets federal standards for the equipment listed in Table C403.3.2(2) or Table C403.3.2(9) OR Air to Water heat pump units that are configured to provide both heating and cooling and are rated in accordance with AHRI 550/590	Variable Refrigerant Heat Pump or Air-to-Water Heat Pump	3.0	5.0	8.0

Table R406.3 Energy Credits				
Option No.	Category	Select Options	Energy Credits	Brief Description of Selected Options*
1	Efficient Building Envelope	Not Selected	0.0	-
2	Air Leakage Control and Efficient Ventilation			
3.1 -3.10	High Efficiency HVAC	Option 3.6	1.0	Air source ducted Heat Pump w/ Min HSPF2 of 10 (HSPF of 11). If htg design temp is 23F or below, a cold climate variable capacity heat pump is required.
3.11	High Efficiency HVAC: Smart Thermostat		0.0	
4	High Efficiency HVAC Distribution System		0.0	

5.1	Efficient Water Heating: Drain Heat Recovery			0.0	
5.2	Efficient Water Heating: Compact Hot Water Distribution			0.0	
5.3-5.8	Efficient Water Heating		Option 5.3	0.5	Energy Star gas or propane water heater with min UEF of 0.80
6	Renewable Electric Energy	4,200 kWh	Option 6.1	3.5	On-site wind or solar electric energy, 0.5 credit per 600 kWh of generation up to maximum of 4.5 credits
7	Appliance Package			0.0	
Energy Credits				5.0	

*Refer to WSEC 2015 Table R406.2 for complete option descriptions and requirements

THERMAL ENVELOPE DETAILS - Proposed Design

Conditioned Floor Area, Proposed Design	3,947	sq. ft
Classification	Medium Dwelling Unit	
Notes		

Exterior Doors										
Plan ID	Component Description	Ref.	Door U	Qt.	Width		Height		Area	UA
					Feet	Inch	Feet	Inch		
Exempt									0	0.0
	Code Baseline, U=0.30	-	0.30	1	4	0	9	0	36	10.8
									0	0.0
									0	0.0
									0	0.0
									0	0.0
									0	0.0
									0	0.0
									0	0.0
									0	0.0
									0	0.0
									0	0.0
Sum of Area and UA									36	10.8
Exterior Doors Area Weighted U										0.300

Overhead Glazing										
Plan ID	Component Description	Ref.	Glazing U	Qt.	Width		Height		Area	UA
					Feet	Inch	Feet	Inch		
	2021 U-factor Baseline (Table R402.1.2)	Table R402	0.50	4	3	10	3	10	58.8	29
									-	-
									-	-
									-	-
Sum of Area and UA									58.8	29
Overhead Glazing Area Weighted U										0.500

Vertical Glazing Schedule											Rows to Show
Plan ID	Component Description	Ref.	Glazing U	Qt.	Width		Height		Area	UA	
					Feet	Inch	Feet	Inch			
Exempt			-						-	-	
1	4024 FIX U=0.30 (Code Baseline)	Table 406.2	0.30	2	4	0	2	4	18.7	5.60	
2	4070 FIX U=0.30 (Code Baseline)	Table 406.2	0.30	1	4	0	7	0	28.0	8.40	
3	4771 FIX U=0.30 (Code Baseline)	Table 406.2	0.30	1	4	7	7	7	34.8	10.43	
4	4730 FIX U=0.30 (Code Baseline)	Table 406.2	0.30	1	4	7	3	0	13.8	4.13	
5	6071 FIX U=0.30 (Code Baseline)	Table 406.2	0.30	1	6	0	7	1	42.5	12.75	
6	6030 FIX U=0.30 (Code Baseline)	Table 406.2	0.30	1	6	0	3	0	18.0	5.40	
7	3671 FIX U=0.30 (Code Baseline)	Table 406.2	0.30	1	3	6	7	1	24.8	7.44	
8	3630 FIX U=0.30 (Code Baseline)	Table 406.2	0.30	1	3	6	3	0	10.5	3.15	
9	5060 FIX U=0.30 (Code Baseline)	Table 406.2	0.30	1	5	0	6	0	30.0	9.00	
10	4060 CSM U=0.30 (Code Baseline)	Table 406.2	0.30	6	4	0	6	0	144.0	43.20	
11	14090 SG U=0.30 (Code Baseline)	Table 406.2	0.30	1	14	0	9	0	126.0	37.80	
12	4030 FIX U=0.30 (Code Baseline)	Table 406.2	0.30	5	4	0	3	0	60.0	18.00	
13	6060 FIX U=0.30 (Code Baseline)	Table 406.2	0.30	1	6	0	6	0	36.0	10.80	
14	6030 FIX U=0.30 (Code Baseline)	Table 406.2	0.30	1	6	0	3	0	18.0	5.40	
15	6060 SLD U=0.30 (Code Baseline)	Table 406.2	0.30	1	6	0	6	0	36.0	10.80	
16	2660 CSM U=0.30 (Code Baseline)	Table 406.2	0.30	2	2	6	6	0	30.0	9.00	
17									-	-	
18	2020 AWN U=0.30 (Code Baseline)	Table 406.2	0.30	1	2	0	2	0	4.0	1.20	
19	4020AWN U=0.30 (Code Baseline)	Table 406.2	0.30	2	4	0	2	0	16.0	4.80	
20	6040 FIX U=0.30 (Code Baseline)	Table 406.2	0.30	1	6	0	4	0	24.0	7.20	
21	11080 SG U=0.30 (Code Baseline)	Table 406.2	0.30	1	11	0	8	0	88.0	26.40	
22	4040 AWN U=0.30 (Code Baseline)	Table 406.2	0.30	2	4	0	4	0	32.0	9.60	
23	6046 SLD U=0.30 (Code Baseline)	Table 406.2	0.30	1	6	0	4	6	27.0	8.10	
24									-	-	
25	4040FIX U=0.30 (Code Baseline)	Table 406.2	0.30	2	4	0	4	0	32.0	9.60	
26	5049 FIX U=0.30 (Code Baseline)	Table 406.2	0.30	1	5	0	4	9	23.8	7.13	
27	5037 FIX U=0.30 (Code Baseline)	Table 406.2	0.30	1	5	0	3	7	17.9	5.38	
28	4749 FIX U=0.30 (Code Baseline)	Table 406.2	0.30	1	4	7	4	9	21.8	6.53	
29	4737 FIX U=0.30 (Code Baseline)	Table 406.2	0.30	1	4	7	3	7	16.4	4.93	
30	6049 FIX U=0.30 (Code Baseline)	Table 406.2	0.30	1	6	0	4	9	28.5	8.55	
31	6037 FIX U=0.30 (Code Baseline)	Table 406.2	0.30	1	6	0	3	6	21.0	6.30	
32	3649 FIX U=0.30 (Code Baseline)	Table 406.2	0.30	1	3	6	4	9	16.6	4.99	

33	3637 FIX	U=0.30 (Code Baseline)	Table 406.2	0.30	1	3	6	3	7	12.5	3.76
34	3040 CSM	U=0.30 (Code Baseline)	Table 406.2	0.30	1	3	0	4	0	12.0	3.60
35	7060 SLD	U=0.30 (Code Baseline)	Table 406.2	0.30	1	7	0	6	0	42.0	12.60
36	4060 CSM	U=0.30 (Code Baseline)	Table 406.2	0.30	3	4	0	6	0	72.0	21.60
37	2060 AWI	U=0.30 (Code Baseline)	Table 406.2	0.30	3	2	0	6	0	36.0	10.80
38	6060 FIX	U=0.30 (Code Baseline)	Table 406.2	0.30	1	6	0	6	0	36.0	10.80
39	6060 SLD	U=0.30 (Code Baseline)	Table 406.2	0.30	3	6	0	6	0	108.0	32.40
40	3040 CSM	U=0.30 (Code Baseline)	Table 406.2	0.30	1	3	0	4	0	12.0	3.60
41	2640 CSM	U=0.30 (Code Baseline)	Table 406.2	0.30	2	2	6	4	0	20.0	6.00
42										-	-
43										-	-
44										-	-
45										-	-
46										-	-
47										-	-
48										-	-
49										-	-
50										-	-
Sum of Area and UA										1,390.5	417.1
Vertical Glazing Area Weighted U											0.300
Vertical Glazing and Doors Area Weighted U											0.300

Flat/Vaulted Ceilings							
Plan ID	Component Description	Ref.	Attic U		Area	UA	
	Flat Roof - 2" Rigid over enclosed Batt TJH 11 7/8	Custom	0.019		1,952	37.1	
					0		
Sum of Area and UA					1,952	37.1	

Refer to WSEC R402.1

Walls (Above Grade)							
Plan ID	Component Description	Ref.	Wall U		Net Area	UA	
	R21 cavity+R0 foam INT 2X6W Lap (Code Baseline)	10-5	0.054		3,678	199	
Sum of Area and UA					3,678	199	

Floor (over crawl or exterior)						
Plan ID	Component Description	Ref.	Floor U		Area	UA
	R30 vented Post/Beam (Code Baseline)	10-3	0.028		635	18
Sum of Area and UA					635	18

Slab on Grade (less than 2 feet below grade)						
Plan ID	Component Description	Ref.	Slab F		Slab Perim	FP
Sum of Perimeter and FP					0	0

Below Grade Walls and Slabs										
Plan ID	Component Description	Slab Depth	Ref.	Wall U	Wall Area	Wall UA	Slab F	Slab Perim	Slab UA	
	R21 Batt	3.5' depth	WSU	0.038	661	25.1	0.630	111	70	
Sum of Area, Length and UA					661	25.1		111	70	

Links to Download Forms, Checklists and Other Resources		Link
Compliance Certificate		Compliance Certificate Instructions
Insulation Certificate for Residential New Construction		Insulation Certificate
Duct Testing Affidavits	Existing Construction	Affidavit, Existing
	New Construction	Affidavit, New
Prescriptive Checklist for 2018 WSEC		Prescriptive Checklist
Alterations (Remodel) Worksheet		Worksheet
EER SEER2 COP HSPF2 Converter		https://www.adicotengineering.com/eer-seer2-cop-hspf2-kwton-converter

Show Ventilation Calculator?	Show
Ventilation Requirements	
Conditioned Floor Area	3,947 sq. ft.
Number of Bedrooms	5
Run-Time Percent in Each 4-Hour Segment	100%
Is the system Balanced?	Unbalanced
Is the system Distributed?	Distributed
Ventilation Code Section	IRC, Chapter 15
Whole House Mechanical Ventilation Airflow Rate	106 CFM

Show Distribution System Calculator?	Show
HVAC Thermal Distribution System	
Download RS-33 (2018) http://www.energy.wsu.edu/Documents/Duct%20Testing%20Standards%20_2018	
Is this a hydronic heating system?	No
Location of Ducts	Unconditioned Space
Location of Air Handler	Conditioned Space
Is Duct Testing Required? Yes	
Maximum Duct Leakage:	
Is this a post-construction test?	Yes
Maximum total measured duct leakage per square foot	0.04 CFM25 per sq. ft.
Maximum allowable total measured duct leakage	158 CFM25

Show Heating System Sizing?	Show
Heating System Sizing - Proposed Design	
Try Out BetterBuiltNW's HVAC Sizing Tool: https://betterbuiltnw.com/resources/hvac-sizing-tool	
Nearest Weather Station	Mercer Island
Indoor Design Temperature	70 F
Outdoor Design Temperature	25 F
Design Temperature Difference (ΔT)	45 F
Conditioned Floor Area, Proposed Design	3,947 ft2

Conditioned Volume <small>Leave blank to use default of 8.5 ft. ceiling height</small>	<input type="text" value="38,348"/> ft ³	Average ceiling height =9.7 ft. Volume = 38348 ft³
Average ceiling height	<input type="text" value="9.7"/> ft	
HVAC System Type	<input type="text" value="Heat Pump"/>	
Location of HVAC Distribution System	<input type="text" value="Unconditioned Space"/>	
Sum of UA, including exempt door and window	<input type="text" value="806"/>	
Envelope Heat Load <small>Sum of UA X ΔT</small>	<input type="text" value="36,264"/> Btu / Hour	
Air Leakage Heat Load <small>((Volume X 0.6) X ΔT) X .018))</small>	<input type="text" value="18,637"/> Btu / Hour	
Building Design Heat Load <small>Air Leakage + Envelope Heat Loss</small>	<input type="text" value="54,901"/> Btu / Hour	
Building and Duct Heat Load <small>For ducts located in unconditioned space: Sum of Building Heat Loss X 1.1 For ducts located in conditioned space or ductless: Sum of Building Heat Loss X 1</small>	<input type="text" value="60,391"/> Btu / Hour	
Maximum Heat Equipment Output <small>Building and Duct Heat Loss X 1.25 for heat pumps Building and Duct Heat Loss X 1.40 for all other systems</small>	<input type="text" value="75,489"/> Btu / Hour <input type="text" value="22.1"/> kW	



Caution: Photovoltaic system performance predictions calculated by PVWatts® include many inherent assumptions and uncertainties and do not reflect variations between PV technologies nor site-specific characteristics except as represented by PVWatts® inputs. For example, PV modules with better performance are not differentiated within PVWatts® from lesser performing modules. Both NREL and private companies provide more sophisticated PV modeling tools (such as the System Advisor Model at [//sam.nrel.gov](http://sam.nrel.gov)) that allow for more precise and complex modeling of PV systems.

The expected range is based on 30 years of actual weather data at the given location and is intended to provide an indication of the variation you might see. For more information, please refer to this NREL report: The Error Report.

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RESULTS

5,784 kWh/Year*

System output may range from 5,520 to 5,979 kWh per year near this location.

Month	Solar Radiation (kWh / m ² / day)	AC Energy (kWh)
January	1.46	199
February	2.44	304
March	3.19	432
April	4.99	636
May	5.16	675
June	5.55	686
July	6.26	785
August	5.96	754
September	4.64	579
October	2.68	356
November	1.49	199
December	1.31	181
Annual	3.76	5,786

Location and Station Identification

Requested Location	9412 SE 33rd st mercer island	
Weather Data Source	Lat, Lng: 47.57, -122.22	0.8 mi

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The energy output range is based on analysis of 30 years of historical weather data, and is intended to provide an indication of the possible interannual variability in generation for a Fixed (open rack) PV system at this location.

Latitude	47.57° N
Longitude	122.22° W

PV System Specifications

DC System Size	5.5 kW
Module Type	Standard
Array Type	Fixed (open rack)
System Losses	14%
Array Tilt	20°
Array Azimuth	180°
DC to AC Size Ratio	1.2
Inverter Efficiency	96%
Ground Coverage Ratio	0.4
Albedo	<i>From weather file</i>
Bifacial	No (0)
	Jan Feb Mar Apr May June
	0% 0% 0% 0% 0% 0%
Monthly Irradiance Loss	July Aug Sept Oct Nov Dec
	0% 0% 0% 0% 0% 0%

Performance Metrics

DC Capacity Factor	12.0%
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