

Project Information	
Mercer Island 6427 6427 E Mercer Way Mercer Island, WA 98040	
Contact Information	
Citizen Design Attn: Jacob Young 10 Dravus Street Seattle, WA 98109	

Messages / Comments *	
RESULT= PASS	
UA Reduction = 87.12, Proposed UA is better than baseline by 15.1%	
UA reduction meets percent target of selected Option 1.2	
Window area is 11% of floor area	
-	
Whole House Mechanical Ventilation Airflow Rate: 95 CFM with Run Time Percent of 100%, Balanced, Distributed	
Maximum allowable total measured duct leakage: 451 CFM25	

* 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?	Total UA Alternative, Whole Building Trade Off Analysis
Project Building Type?	New Construction
Occupancy Type?	R3 Single family dwellings and townhouses
Code Version?	WSEC 2021
Classification:	Large Dwelling Unit -- 5637 sq. ft.
Baseline Description:	Code Baseline - Maximum baseline window area is 15% of floor area.
About Your Selection:	No exempt window or door areas

RESULTS - Comparison of Baseline and Proposed Design **						
Component Performance, R occupancies			Baseline		Proposed Design	
	U *	Area	UA	U	Area	UA
Doors U =	0.300	152	45.6	0.280	152	42.6
Overhead Glazing U =	0.500	0	0.0		0	0.0
Vertical Glazing U =	0.300	624	187.2	0.280	624	174.7
Flat/Vaulted Ceilings U =	0.024	1,978	47.5	0.020	1,978	39.6
Wall (above grade) U =	0.056	2,554	143.0	0.043	2,554	109.2
Floors over Crawlspace U =	0.029	0	0.0		0	0.0
Slab on Grade F =	0.540	0	0.0		0	0.0
Below Grade Wall U =	0.035	1,630	57.1	0.040	1,630	65.2
Below Grade Slab F =	0.500	191	95.5	0.301	191	57.5
			* Values from Table R402.1.2 (Oct 2023)			
Baseline UA Total			575.9	Proposed UA Total		
Required Credits			9.0	Proposed Credits		
				9.0 from Tables 406.2 and 406.3		
				UA Percent Reduction		
				15%		
				UA Reduction		
				87.1		

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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	6.0	9.0

Table R406.3 Energy Credits					
Option No.	Category	Select Options	Energy Credits	Brief Description of Selected Options*	
1	Efficient Building Envelope	Option 1.2	1.0	Perscriptive compliance per Table 402.1.3 / U-0.25 vertical fenestration / R-38 floors or R-10 perimeter & fully insulated slab. Or 15% reduction in UA per section R402.1.5	
2	Air Leakage Control and Efficient Ventilation	Option 2.2	1.5	Per Section R402.4.1.2 /1.5 ACH50 / For R-2, 0.20 cfm per ft2 at 50 Pa. / HRV with min SHR eff of 0.75 per IRC Section M1505.3 or IMC Section 403.8	
3.1 -3.10	High Efficiency HVAC	Option 3.3	0.5	Air Source centrally ducted Heat Pump Min HSPF2 of 9 (HSPF of 9.5), in areas where winter design temp. is 23° F or less, a NEEP or ASHP cold climate unit shall be installed.	
3.11	High Efficiency HVAC: Smart Thermostat	Option 3.11	0.5	Connected Energy Star Certified smart thermostat.	
4	High Efficiency HVAC Distribution System	Option 4.1	0.5	Ducts/distribution system in conditioned space per R403.3.2 Electric resistance, hydronic, ductless and gas fired systems < 80% AFUE systems not permitted	
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 5.6	2.0	Electric heat pump water heater meeting NEEA Tier 3.	
6	Renewable Electric Energy		kWh	0.0	
7	Appliance Package			0.0	
			Energy Credits	6.0	

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

THERMAL ENVELOPE DETAILS - Proposed Design

Conditioned Floor Area, Proposed Design		5,637	sq. ft
Classification		Large Dwelling Unit	
Notes			

Exterior Doors										
Plan ID	Component Description	Ref.	Door U	Qt.	Width		Height		Area	UA
					Feet	Inch	Feet	Inch		
4080	U=0.28	-	0.28	1	4	0	8	0	32	9.0
12080	U=0.28	-	0.28	1	12	0	8	0	96	26.9
3080	U=0.28	-	0.28	1	3	0	8	0	24	6.7
									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									152	42.6
Exterior Doors Area Weighted U										0.280

Overhead Glazing										
Plan ID	Component Description	Ref.	Glazing U	Qt.	Width		Height		Area	UA
					Feet	Inch	Feet	Inch		
N/A									-	
									-	
									-	
									-	
									-	
Sum of Area and UA									0.0	0
Overhead Glazing Area Weighted U										

Vertical Glazing Schedule											Rows to Show
Plan ID	Component Description	Ref.	Glazing U	Qt.	Width		Height		Area	UA	
					Feet	Inch	Feet	Inch			
1	1,25,26 U=0.28 (2018 1.3, 1.7)	Table 406.2	0.28	3	7	0	5	0	105.0	29.40	
2	2, 3 U=0.28 (2018 1.3, 1.7)	Table 406.2	0.28	2	5	0	5	0	50.0	14.00	
3	4,5 U=0.28 (2018 1.3, 1.7)	Table 406.2	0.28	2	4	0	6	0	48.0	13.44	
4	6 U=0.28 (2018 1.3, 1.7)	Table 406.2	0.28	1	5	0	4	6	22.5	6.30	
5	9, 11 U=0.28 (2018 1.3, 1.7)	Table 406.2	0.28	2	7	0	6	0	84.0	23.52	
6	10 U=0.28 (2018 1.3, 1.7)	Table 406.2	0.28	1	3	0	8	0	24.0	6.72	
7	12,13 U=0.28 (2018 1.3, 1.7)	Table 406.2	0.28	2	1	6	3	6	10.5	2.94	
8	14,15,22 U=0.28 (2018 1.3, 1.7)	Table 406.2	0.28	3	2	0	4	0	24.0	6.72	
9	16 U=0.28 (2018 1.3, 1.7)	Table 406.2	0.28	1	5	0	4	0	20.0	5.60	
10	17 U=0.28 (2018 1.3, 1.7)	Table 406.2	0.28	1	6	0	6	0	36.0	10.08	
11	18, 20 U=0.28 (2018 1.3, 1.7)	Table 406.2	0.28	2	6	0	5	0	60.0	16.80	
12	19 U=0.28 (2018 1.3, 1.7)	Table 406.2	0.28	1	8	0	5	0	40.0	11.20	
13	21,24 U=0.28 (2018 1.3, 1.7)	Table 406.2	0.28	2	6	0	4	0	48.0	13.44	
14	23 U=0.28 (2018 1.3, 1.7)	Table 406.2	0.28	2	2	0	4	0	16.0	4.48	
15	27,28,29 U=0.28 (2018 1.3, 1.7)	Table 406.2	0.28	3	3	0	4	0	36.0	10.08	
Sum of Area and UA									624.0	174.7	
Vertical Glazing Area Weighted U										0.280	
Vertical Glazing and Doors Area Weighted U										0.280	

Flat/Vaulted Ceilings										
Plan ID	Component Description	Ref.	Attic U						Area	UA
R1	R49 batt Vault 24oc	-	0.020						1,662	33.2
R3	R49 batt Vault 24oc	-	0.020						316	6.3
Sum of Area and UA									1,978	39.6

Walls (Above Grade)										
Plan ID	Component Description	Ref.	Wall U						Net Area	UA
W1	R21 cavity+R5 foam INT 2X6W Lap	10-5	0.041						2,209	91
W4	R21 cavity+R0 foam INT 2X6W Lap (Code Baseline)	10-5	0.054						345	19
Sum of Area and UA									2,554	109

Floor (over crawl or exterior)						
Plan ID	Component Description	Ref.	Floor U		Area	UA
N/A						
Sum of Area and UA					0	0

Slab on Grade (less than 2 feet below grade)						
Plan ID	Component Description	Ref.	Slab F		Slab Perim	FP
N/A						
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	
F3	R11 Batt + R5 ci R10 Fully Underslab	7' depth	Baylon & Ker	0.040	1,630	65.2	0.301	191	57	
Sum of Area, Length and UA					1,630	65.2		191	57	

Links to Download Forms, Checklists and Other Resources		Link
Compliance Certificate		Compliance Certificate
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?

Ventilation Requirements	
Conditioned Floor Area	5,637 sq. ft.
Number of Bedrooms	5
Run-Time Percent in Each 4-Hour Segment	100%
Is the system Balanced?	Balanced
Is the system Distributed?	Distributed
Ventilation Code Section	IRC, Chapter 15
Whole House Mechanical Ventilation Airflow Rate	95 CFM

Verify system meets definition of 'Balanced Whole-House Ventilation'
Verify system meets definition of 'Distributed Whole-House Ventilation'

Show Distribution System Calculator?

HVAC Thermal Distribution System	
Is this a hydronic heating system?	No
Location of Ducts	Conditioned Space
Location of Air Handler	Conditioned Space
Is Duct Testing Required?	Yes
Maximum Duct Leakage:	
Maximum total measured duct leakage per square foot	0.08 CFM25 per sq. ft.
Maximum allowable total measured duct leakage	451 CFM25

A maximum of 10 feet of return ducts and 5 feet of supply ducts are allowed to be located outside of the building thermal envelope, if insulated and sealed per R403.3.7.

Show Heating System Sizing?

Heating System Sizing - Proposed Design	
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	5,637 ft2
Conditioned Volume	50,733 ft3
Average ceiling height = 9 ft. Volume = 50733 ft3	
Average ceiling height	9.0 ft
HVAC System Type	Heat Pump
Location of HVAC Distribution System	Conditioned Space
Sum of UA	489
Envelope Heat Load	21,994 Btu / Hour
Air Leakage Heat Load	24,656 Btu / Hour
Building Design Heat Load	46,651 Btu / Hour
Building and Duct Heat Load	46,651 Btu / Hour
Maximum Heat Equipment Output	58,313 Btu / Hour
	17.1 kW