

Project Information	
Mercer Island 6423 Lot B TBA E Mercer Way Mercer Island, WA 98040	
Contact Information	
Citizen Design Attn: Isaac Greenetz 3800 Woodland Park Avenue N #300 Seattle, WA 98103	

Messages / Comments *	RESULT= PASS
<p>Note: Review required for custom entries: - Vertical Glazing- Flat/Vaulted Ceilings</p> <p>UA Reduction = 120.46, Proposed UA is better than baseline by 16%</p> <p>UA reduction meets percent target of selected Option 1.2</p> <p>Vertical glazing area of proposed design exceeds 15% of floor area. Baseline window area set to 15% of floor area</p> <p>-</p> <p>Whole House Mechanical Ventilation Airflow Rate: 90 CFM with Run Time Percent of 100%, Balanced, Distributed</p> <p>Maximum allowable total measured duct leakage: 327 CFM25</p> <p><small>* Results assume your inputs are complete and correct. Results do not constitute an approval. Analysis should be reviewed by your AHJ.</small></p>	

ANALYSIS SET UP	
<p>What code compliance pathway are you using? Total UA Alternative, Whole Building Trade Off Analysis</p> <p>Project Building Type? New Construction</p> <p>Occupancy Type? R3 Single family dwellings and townhouses</p> <p>Code Version? WSEC 2021</p> <p>Classification: Medium Dwelling Unit -- 4083 sq. ft.</p> <p>Baseline Description: Code Baseline - Maximum baseline window area is 15% of floor area.</p> <p>About Your Selection: No exempt window or door areas</p>	

RESULTS - Comparison of Baseline and Proposed Design **						
Component Performance, R occupancies	Baseline			Proposed Design		
	U *	Area	UA	U	Area	UA
Doors U =	0.300	310	92.9	0.300	310	92.9
Overhead Glazing U =	0.500	13	6.3	0.500	13	6.3
Vertical Glazing U =	0.300	600	180.0	0.231	821	189.4
Flat/Vaulted Ceilings U =	0.024	3,673	88.1	0.017	3,673	62.8
Wall (above grade) U =	0.056	4,044	226.4	0.039	3,823	150.7
Floors over Crawlspace U =	0.029	2,989	86.7	0.025	2,989	74.7
Slab on Grade F =	0.540	0	0.0		0	0.0
Below Grade Wall U =	0.035	611	21.4	0.040	611	24.4
Below Grade Slab F =	0.500	100	50.0	0.301	100	30.1
<small>* Values from Table R402.1.2 (Oct 2023)</small>						
Baseline UA Total		751.8		Proposed UA Total		631.4
Required Credits		8.0		Proposed Credits		8.0
				UA Percent Reduction		16%
				UA Reduction		120.5
						<small>from Tables 406.2 and 406.3</small>

** 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	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 2.1	1.0	Per Section R402.4.1.2 / 2.0 ACH50 / For R-2, 0.25 cfm per ft2 at 50 Pa. / HRV with min SHR eff of 0.65 per IRC Section M1505.3 or IMC Section 403.8
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	Not Selected	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		0.0	
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	4,083 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		
A	Code Baseline, U=0.30	-	0.30	1	6	0	8	0	48	14.4
B	Code Baseline, U=0.30	-	0.30	1	3	0	7	3	22	6.5
C	Code Baseline, U=0.30	-	0.30	1	14	0	9	0	126	37.8
D	Code Baseline, U=0.30	-	0.30	1	12	0	7	6	90	27.0
H	Code Baseline, U=0.30	-	0.30	1	3	0	8	0	24	7.2
									0	0.0
									0	0.0
									0	0.0
									0	0.0
									0	0.0
Sum of Area and UA									310	92.9
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		
49	2021 U-factor Baseline (Table R402.1.2)	Table R402	0.50	1	3	6.5	3	6.5	12.5	6
									-	-
									-	-
									-	-
Sum of Area and UA									12.5	6
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			
1	15,19,23 U=0.23	Custom	0.23	3	2	0	3	0	18.0	4.14	Refer to WSEC R402.1.
2	16,20,24 U=0.24 (2018 1.1)	Table 406.2	0.24	3	2	0	5	0	30.0	7.20	Refer to WSEC R402.1.
3	4,5 U=0.23	Custom	0.23	2	2	0	6	0	24.0	5.52	Refer to WSEC R402.1.
4	18 U=0.23	Custom	0.23	1	2	0	8	0	16.0	3.68	Refer to WSEC R402.1.
5	3,7 U=0.23	Custom	0.23	2	2	6	1	10	9.2	2.11	Refer to WSEC R402.1.
6	2,6 U=0.24 (2018 1.1)	Table 406.2	0.24	2	2	6	4	2	20.8	5.00	
7	28,30,32 U=0.23	Custom	0.23	3	3	0	3	0	27.0	6.21	Refer to WSEC R402.1.
8	34,36,38 U=0.23	Custom	0.23	3	3	0	3	0	27.0	6.21	Refer to WSEC R402.1.
9	40,42,44 U=0.23	Custom	0.23	3	3	0	3	0	27.0	6.21	Refer to WSEC R402.1.
10	12 U=0.23	Custom	0.23	1	3	0	5	0	15.0	3.45	Refer to WSEC R402.1.
11	29,31 U=0.23	Custom	0.23	2	3	0	5	6	33.0	7.59	Refer to WSEC R402.1.
12	33,35,37 U=0.23	Custom	0.23	3	3	0	5	6	49.5	11.39	Refer to WSEC R402.1.
13	39,41,43 U=0.23	Custom	0.23	3	3	0	5	6	49.5	11.39	Refer to WSEC R402.1.
14	11 U=0.23	Custom	0.23	1	3	0	7	0	21.0	4.83	Refer to WSEC R402.1.
15	17 U=0.23	Custom	0.23	1	3	0	8	0	24.0	5.52	Refer to WSEC R402.1.
16	45,46 U=0.23	Custom	0.23	2	3	6	2	0	14.0	3.22	Refer to WSEC R402.1.
17	47,48 U=0.23	Custom	0.23	2	3	6	2	0	14.0	3.22	Refer to WSEC R402.1.
18	8 U=0.23	Custom	0.23	1	3	6	6	0	21.0	4.83	Refer to WSEC R402.1.
19	14,21 U=0.23	Custom	0.23	2	4	0	8	0	64.0	14.72	Refer to WSEC R402.1.
20	22,25 U=0.23	Custom	0.23	2	4	0	8	0	64.0	14.72	Refer to WSEC R402.1.
21	1,9,10 U=0.23	Custom	0.23	3	6	0	6	0	108.0	24.84	Refer to WSEC R402.1.
22	13,26 U=0.23	Custom	0.23	2	8	0	8	0	128.0	29.44	Refer to WSEC R402.1.
23	27 U=0.24 (2018 1.1)	Table 406.2	0.24	1	3	0	5	6	16.5	3.96	Refer to WSEC R402.1.
Sum of Area and UA									820.5	189.4	
Vertical Glazing Area Weighted U										0.231	
Vertical Glazing and Doors Area Weighted U										0.250	

Flat/Vaulted Ceilings											
Plan ID	Component Description	Ref.	Attic U						Area	UA	
R1	2x12 Roof w/ 2" min. Sloped Rigid & R-38 Batt	Custom	0.019						205	3.9	Refer to WSEC R402.1.
R2	R60 batt Vault 24oc	-	0.017						3,468	59.0	
Sum of Area and UA									3,673	62.8	

Walls (Above Grade)											
Plan ID	Component Description	Ref.	Wall U						Net Area	UA	
W1	R23 cavity+R5 foam INT 2X6W T111	App A	0.039						3,680	144	
W5	R23 cavity+R0 foam INT 2X6W T111	App A	0.050						143	7	
Sum of Area and UA									3,823	151	

Floor (over crawl or exterior)						
Plan ID	Component Description	Ref.	Floor U	Area	UA	
F2	R38 vented Joist (2021 1.2, 1.3; 2018 1.3-1.5)	10-3	0.025	2,989	75	
Sum of Area and UA				2,989	75	

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
F3 + W5	R11 Batt + R5 ci R10 Fully Underslab	7' depth	Baylon & Ker	0.040	611	24.4	0.301	100	30
Sum of Area, Length and UA					611	24.4		100	30

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	4,083 sq. ft.	
Number of Bedrooms	5	
Run-Time Percent in Each 4-Hour Segment	100%	
Is the system Balanced?	Balanced	Verify system meets definition of 'Balanced Whole-House Ventilation'
Is the system Distributed?	Distributed	Verify system meets definition of 'Distributed Whole-House Ventilation'
Ventilation Code Section	IRC, Chapter 15	
Whole House Mechanical Ventilation Airflow Rate	90 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	Conditioned Space	
Location of Air Handler	Conditioned Space	
For Existing Construction: Are Any of These Exceptions True?		
Are ducts systems documented to have been previously sealed as confirmed through field verification and diagnostic testing per RS-33?	No	
Is there less than 40 linear feet in unconditioned spaces? (not excepted under WSEC 2021)	No	Inconsistent with input above: Ducts located in conditioned space.
Are existing duct systems constructed, insulated or sealed with asbestos?	No	
Is the project an Addition less than 750 sf of conditioned floor area?	No	
Is Duct Testing Required? Yes		
Maximum Duct Leakage:		
Is this a post-construction test?	Yes	
Is the air handler installed?	No	
Maximum total measured duct leakage per square foot	0.08 CFM25 per sq. ft.	
Maximum allowable total measured duct leakage	327 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?		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	4,083 ft ²	
Conditioned Volume	50,733 ft ³	Ave ceiling = 12.4 ft. Check: Higher than expected conditioned volume
Leave blank to use default of 8.5 ft. ceiling height		
Average ceiling height	12.4 ft	
HVAC System Type	Heat Pump	
Location of HVAC Distribution System	Conditioned Space	
Sum of UA	631	
Envelope Heat Load	28,412 Btu / Hour	
Sum of UA X ΔT		
Air Leakage Heat Load	24,656 Btu / Hour	
((Volume X 0.6) X ΔT) X 0.18))		
Building Design Heat Load	53,068 Btu / Hour	
Air Leakage + Envelope Heat Loss		
Building and Duct Heat Load	53,068 Btu / Hour	
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		
Maximum Heat Equipment Output	66,335 Btu / Hour	
Building and Duct Heat Loss X 1.25 for heat pumps		
	19.4 kW	
Building and Duct Heat Loss X 1.40 for all other systems		