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|-----|------|
| 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 |
| 0.0 | 0.00 |
| 0.0 | 0.00 |

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

| | |
|--------|--------|
| 1394.3 | 418.30 |
| | 0.30 |

Overhead Glazing (Skylights)

| Component Description | Ref. | U-factor |
|--------------------------|------|----------|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

| Qt. | Width | | Height | |
|-----|-------|------|--------|------|
| | Feet | Inch | Feet | Inch |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Area | UA |
|------|------|
| 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

| | |
|-----|------|
| 0.0 | 0.00 |
| | 0.00 |

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

| | |
|--------|--------|
| 1394.3 | 418.30 |
|--------|--------|

Simple Heating System Size: Washington State

This heating system sizing calculator is based on the Prescriptive Requirements of the 2018 and 2021 Washington State Energy Code (WSEC) . 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.

This tool is for the permitting purposes only. A Manual J calculation is required to meet the requirement of the Washington State Energy Code.

Project Information

SEARS PLAT - LOT 4
 97414 - 78th Avenue SE
 Mercer Island, WA 98040

Contact Information

McCullough Architects
 5601 - 6th Ave S, #317
 Seattle, WA 98108

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 25
 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)

4,790

Average Ceiling Height

[Instructions](#)

Average Ceiling Height (ft)

10.0

Conditioned Volume
 47,900

Glazing and Doors

[Instructions](#)

U-0.30

U-Factor X Area = UA
 0.300 X 1,394 = 418.20

Skylights

[Instructions](#)

None

U-Factor X Area = UA
 0.50 X 0 = 0.00

Insulation

Attic

[Instructions](#)

R-60

U-Factor X Area = UA
 0.024 X 2,770 = 66.48

Single Rafter or Joist Vaulted Ceilings

[Instructions](#)

None

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

Above Grade Walls (see Figure 1)

[Instructions](#)

R-21 Intermediate

U-Factor X Area = UA
 0.056 X 3,303 = 184.97

Floors

[Instructions](#)

R-30

U-Factor X Area = UA
 0.029 X 2,631 = 76.30

Below Grade Walls and Slabs (see Figure 1)

[Instructions](#)

Wall & Slab None
 Depth Select nearest slab depth

Wall U-Factor X Area = UA
 -- X 0 = --
Slab F-Factor X Length = UA
 -- X 0 = --

Slab on Grade (see Figure 1)

[Instructions](#)

None

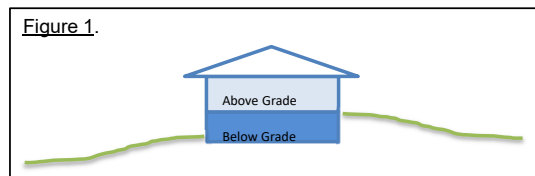
F-Factor X Length = UA
 -- X 0 = --

Location of Ducts

[Instructions](#)

Unconditioned Space

Duct Leakage Coefficient
 1.100



Sum of UA 745.95
Envelope Heat Load 33,568 Btu / Hour
Sum of UA x ΔT
Air Leakage Heat Load 23,279 Btu / Hour
Volume x 0.6 x ΔT x 0.018
Building Design Heat Load 56,847 Btu / Hour
Air leakage + envelope heat loss
Building and Duct Heat Load 62,532 Btu / Hour
Ducts in unconditioned space: sum of building heat loss x 1.10
 Ducts in conditioned space: sum of building heat loss x 1
Maximum Heat Equipment Output 78,165 Btu / Hour
Building and duct heat loss x 1.40 for forced air furnace
 Building and duct heat loss x 1.25 for heat pump

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| Project Information |
| 7414 - 78th Avenue East Mercer Island, WA 98040 Sears Plat - Lot 4 |
| Contact Information |
| McCullough Architects 5601 - 6Th Ave S, #317 Seattle, WA 98108 206-443-1181 |

| | |
|--|---------------------|
| Messages / Comments * | RESULT= PASS |
| UA Reduction = 6.61, Proposed UA is better than baseline by 1% Window area is 29% of floor area - Whole House Mechanical Ventilation Airflow Rate: 178.125 CFM with Run Time Percent of 66%, Balanced, Not Distributed Maximum allowable total measured duct leakage: 192 CFM25 <small>* Results assume your inputs are complete and correct. Results do not constitute an approval. Analysis should be reviewed by your AHJ.</small> | |

| | |
|---|---|
| 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 -- 4790 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 | | | Proposed Design | | | |
| | Baseline Design | | | | | |
| | U * | Area | UA | U | Area | UA |
| Doors U = | 0.300 | 0 | 0.0 | | 0 | 0.0 |
| Overhead Glazing U = | 0.500 | 0 | 0.0 | | 0 | 0.0 |
| Vertical Glazing U = | 0.300 | 1,394 | 418.2 | 0.300 | 1,394 | 418.2 |
| Flat/Vaulted Ceilings U = | 0.024 | 2,770 | 66.5 | 0.024 | 2,770 | 66.5 |
| Wall (above grade) U = | 0.056 | 3,303 | 185.0 | 0.054 | 3,303 | 178.4 |
| Floors over Crawlspace U = | 0.029 | 2,631 | 76.3 | 0.029 | 2,631 | 76.3 |
| Slab on Grade F = | 0.540 | 0 | 0.0 | | 0 | 0.0 |
| Below Grade Wall U = | N/A | 0 | | | 0 | 0.0 |
| Below Grade Slab F = | N/A | 0 | | | 0 | 0.0 |
| | * Values from Table R402.1.2 (Oct 2023) | | | | | |
| | Baseline UA Total | | 745.9 | Proposed UA Total | | 739.3 |
| | Required Credits | | 8.0 | Proposed Credits | | 8.0 from Tables 406.2 and 406.3 |
| | | | | UA Percent Reduction | | 1% |
| | | | | UA Reduction | | 6.6 |
| 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. | | | | | | |

** 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) |
| 2 | For heating system using a heat pump that meets federal standards for the equipment listed in Table C403.3.2(2) and supplemental heating provided by electric resistance or a combustion furnace meeting minimum standards Listed in Table C403.3.2(5)b found in the 2021 WSEC - COMMERCIAL ENERGY CODE. | Heat Pump with Supplemental Heating | 1.5 | 6.5 | 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 | | 0.0 | |
| 3.11 | High Efficiency HVAC: Smart Thermostat | Not Selected | 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 | | Not Selected | 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 | 5,400 kWh | Option 6.1 | 4.5 | 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 | | | | 6.5 | |

*Refer to WSEC 2021 Table R406.3 for complete option descriptions and requirements <https://sbcc.wa.gov/state-codes-regulations-guidelines/state-building-code/energy-code>

| Floor (over crawl or exterior) | | | | | | |
|--------------------------------|----------------------------------|------|---------|--|-------|-------|
| Plan ID | Component Description | Ref. | Floor U | | Area | UA |
| F3 | R30 vented Joist (Code Baseline) | 10-3 | 0.029 | | 2,151 | 62 |
| F2 | R30 vented Joist (Code Baseline) | 10-3 | 0.029 | | 480 | 14 |
| | | | | | | |
| | | | | | | |
| Sum of Area and UA | | | | | 2,631 | 76 |
| Area Weighted U-Value | | | | | | 0.029 |

| 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 |
| Area Weighted U-Value | | | | | | |

| Below Grade Walls and Slabs | | | | | | | | | | |
|-----------------------------|-----------------------|------------|------|--------|-----------|---------|--------|------------|---------|--|
| Plan ID | Component Description | Slab Depth | Ref. | Wall U | Wall Area | Wall UA | Slab F | Slab Perim | Slab UA | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| Sum of Area, Length and UA | | | | | | 0 | 0 | 0 | 0 | |
| Weighted U- and F-values | | | | | | | | | | |

| 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? | | Show |
|---|-----------------|--|
| Ventilation Requirements | | |
| Conditioned Floor Area | 4,790 sq. ft. | |
| Number of Bedrooms | 5 | |
| Run-Time Percent in Each 4-Hour Segment | 66% | |
| Is the system Balanced? | Balanced | Verify system meets definition of 'Balanced Whole-House Ventilation' |
| Is the system Distributed? | Not Distributed | |
| Ventilation Code Section | IRC, Chapter 15 | |
| Whole House Mechanical Ventilation Airflow Rate | 178 CFM | |

| Show Distribution System Calculator? | | Show |
|---|------------------------|------|
| HVAC Thermal Distribution System | | |
| Is this a hydronic heating system? | No | |
| Location of Ducts | Unconditioned Space | |
| Location of Air Handler | Unconditioned 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 | 192 CFM25 | |

| Show Heating System Sizing? | | Show |
|---|---------------|------|
| Heating System Sizing - Proposed Design | | |
| Try Out BetterBuiltNW's HVAC Sizing Tool: https://betterbuiltinw.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 | 4,790 ft ² | |
| Conditioned Volume | <input type="text" value="49,950"/> ft ³ | Ave ceiling = 10.4 ft. Check: Higher than expected conditioned volume |
| <small>Leave blank to use default of 8.5 ft. ceiling height</small> | | |
| Average ceiling height | 10.4 ft | |
| HVAC System Type | <input type="text" value="Heat Pump"/> | |
| Location of HVAC Distribution System | Unconditioned Space | |
| Sum of UA, including exempt door and window | <input type="text" value="739"/> | |
| Envelope Heat Load | <input type="text" value="33,270"/> Btu / Hour | |
| <small>Sum of UA X ΔT</small> | | |
| Air Leakage Heat Load | <input type="text" value="24,276"/> Btu / Hour | |
| <small>((Volume X 0.6) X ΔT) X .018))</small> | | |
| Building Design Heat Load | <input type="text" value="57,546"/> Btu / Hour | |
| <small>Air Leakage + Envelope Heat Loss</small> | | |
| Building and Duct Heat Load | <input type="text" value="63,301"/> Btu / Hour | |
| <small>For ducts located in unconditioned space: Sum of Building Heat Loss X 1.1</small> | | |
| <small>For ducts located in conditioned space or ductless: Sum of Building Heat Loss X 1</small> | | |
| Maximum Heat Equipment Output | <input type="text" value="79,126"/> Btu / Hour | |
| <small>Building and Duct Heat Loss X 1.25 for heat pumps</small> | <input type="text" value="23.2"/> kW | |
| <small>Building and Duct Heat Loss X 1.40 for all other systems</small> | | |