

Multifamily Dwelling Unit Sample

ANSI / RESNET / ACCA 310 HVAC Design Report ^{1, 2}

| 1. Design Basis & Architectural Scope | | | | | | | | | | | | | |
|---|--|-------------------------|-------------------------------------|---------------------|--|---------------------|------------------|------------------------------|--|--------|--|-------|--|
| 1.1 Design description (optional): | | | | | Design for Units A-1 to A-3, B-1 to B-3, all options | | | | | | | | |
| 1.2 Designer company: Superior HVAC Design Incorporated | | | | | Designer name: Ms. Maximum Designer | | Date: 12-01-2020 | | | | | | |
| 1.3 Software name and version used to complete design: | | | | | Acme Design Software, v1.0 | | | N/A <input type="checkbox"/> | | | | | |
| For a Dwelling, Townhouse, or Dwelling / Sleeping Unit Within (i.e., duplex): | | | | | | | | | | | | | |
| 1.4 Architectural plan name or address of the property: | | | | | | | | | | | | | |
| 1.5 Architectural options used in the design: ³ | | | | | | | | | | | | | |
| 1.6 Other architectural options that the design can be used with: ⁴ | | | | | | | | | | | | | |
| For a Dwelling / Sleeping Unit Not Within a Dwelling or Townhouse (e.g., condo, apartment): | | | | | | | | | | | | | |
| 1.7 Unique ID for the bldg. that the dwelling / sleeping unit is in: ⁵ | | | | | Success Lofts @ 135 Prosper Ave | | | | | | | | |
| 1.8 Architectural plan used in design (e.g., dwelling unit model): | | | | | Unit A-3 | | | | | | | | |
| 1.9 Other architectural plans that the design can be used with: ⁶ | | | | | Unit A-1, Unit A-2, Unit B-1, Unit B-2, Unit B-3 | | | | | | | | |
| 1.10 Architectural options used in the design: ³ | | | | | Balcony with sliding glass door | | | | | | | | |
| 1.11 Other architectural options that the design can be used with: ⁴ | | | | | Media Room | | | | | | | | |
| 1.12 Dwelling / sleeping unit location used in design: ⁷ | | | | | Top-Floor Corner Unit | | | | | | | | |
| 2. Dwelling-Unit Mechanical Ventilation System Design | | | | | | | | | | | | | |
| Ventilation System Type & Control Location: | | System 1 | | System | | System | | | | | | | |
| 2.1 Unique name or ID for each system: ⁸ | | Whole Dwelling Unit ERV | | | | | | | | | | | |
| 2.2 Vent. equipment manufacturer & model #: ⁹ | | Broan DEF782 | | | | | | | | | | | |
| 2.3 Specified system type: ¹⁰ | | ERV | | | | | | | | | | | |
| 2.4 Specified control location: ¹¹ | | Main Hallway Wall | | | | | | | | | | | |
| 2.5 Ventilation zone name(s) served by system: ¹² | | Whole Dwelling Unit | | | | | | | | | | | |
| Ventilation Zone Served by Ventilation System: | | Zone 1 | | Zone | | Zone | | | | | | | |
| 2.6 Ventilation zone name: ¹² | | Whole Dwelling Unit | | | | | | | | | | | |
| 2.7 Design basis: ¹³ | | 62.2-2010 | | | | | | | | | | | |
| 2.8 Floor area (sq. ft.) and # bedrooms in vent. zone: | | 1,000 2 | | | | | | | | | | | |
| 2.9 Ventilation design airflow rate (CFM): ¹⁴ | | 60 | | | | | | | | | | | |
| 2.10 Vent. runtime per cycle & cycle time (mins): | | 40 of every 60 | | of every | | of every | | | | | | | |
| 2.11 Time-averaged mechanical vent. rate (CFM): ¹⁵ | | 40 | | | | | | | | | | | |
| 3. Heat Gain & Heat Loss Loads | | | | | | | | | | | | | |
| 3.1 Design basis for the loads: ¹⁶ ACCA Manual J v8 2016 | | | 3.2 Load methodology: ¹⁷ | | | Room-by-Room | | | | | | | |
| 3.3 Indoor design temperatures used in loads (°F): | | | Heating Season: 70 | | Cooling Season: 75 | | | | | | | | |
| 3.4 Outdoor design temperatures used in loads (°F): ¹⁸ | | | Heating Season: 14 | | Cooling Season: 94 | | | | | | | | |
| 3.5 Outdoor design temperature location & data source: ¹⁹ | | | Fairfax, VA | | Data Source: ASHRAE | | | | | | | | |
| Zone-Specific Inputs & Loads at Design Conditions | | Zone 1 | | Zone | | Zone | | | | | | | |
| 3.6 Name of heated or cooled zone: ²⁰ | | Whole Dwelling Unit | | | | | | | | | | | |
| 3.7 Occupants & total occup. internal gains (Btuh): ²¹ | | 3 1,290 | | | | | | | | | | | |
| 3.8 Total non-occupant internal gains (Btuh): | | 3,000 | | | | | | | | | | | |
| 3.9 Conditioned floor area (sq. ft.): ²² | | 1,000 | | | | | | | | | | | |
| 3.10 Window area (sq. ft.): ²³ | | 155 | | | | | | | | | | | |
| 3.11 Predominant window SHGC: ²⁴ | | 0.30 | | | | | | | | | | | |
| 3.12 Predominant insulation nominal R-value: ^{24, 25} | | Wall: 15 Ceiling: 38 | | Wall: Ceiling: | | Wall: Ceiling: | | | | | | | |
| 3.13 Infiltration rate (Qualitative or ACH50): ²⁶ | | 3.0 | | | | | | | | | | | |
| 3.14 Time-averaged mechanical vent. rate (CFM): | | 40 | | | | | | | | | | | |
| 3.15 Heat gain (kBtuh): ²⁷ | | Sensible | | Latent | | Total | | Sensible | | Latent | | Total | |
| | | N | | 18.0 4.6 | | 22.6 | | | | | | | |
| | | NE | | 18.5 4.6 | | 23.1 | | | | | | | |
| | | E | | 19.0 4.6 | | 23.6 | | | | | | | |
| | | SE | | 19.5 4.6 | | 24.1 | | | | | | | |
| | | S | | 20.0 4.6 | | 24.6 | | | | | | | |
| | | SW | | 19.5 4.6 | | 24.1 | | | | | | | |
| | | W | | 19.0 4.6 | | 23.6 | | | | | | | |
| NW | | 18.5 4.6 | | 23.1 | | | | | | | | | |
| 3.16 Maximum – minimum total heat gain (kBtuh): ²⁸ | | | | 2.0 | | | | | | | | | |
| 3.17 Total heat loss (kBtuh): | | | | 26.8 | | | | | | | | | |

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| 4. Heating & Cooling Equipment Selection | | Equip. / System 1 | | Equip. / System | | Equip. / System | |
|--|---------------------------|------------------------------|------------------------------|------------------------------|------------------|------------------------------|---|
| Air Conditioners, Heat Pumps, & Other Cooling Equipment (If none of these will be installed, check "N/A") | | | | | | | N/A <input type="checkbox"/> |
| 4.1 Unique name or ID for each system: | Whole Dwelling Unit HP | | | | | | |
| 4.2 Zone that system serves (See Item 3.6): | Whole Dwelling Unit | | | | | | |
| 4.3 Equipment type: ²⁹ | HP | | | | | | |
| 4.4 Evaporator / fan coil mfr. & model #: ³⁰ | Goodman HP15def | | | | | | |
| 4.5 Condenser mfr. & model #: ³⁰ | Goodman Cdr08def | N/A <input type="checkbox"/> | | N/A <input type="checkbox"/> | | N/A <input type="checkbox"/> | |
| 4.6 AHRI ref. #, or check box for alt. OEM doc.: ³¹ | 46554632 | OEM <input type="checkbox"/> | | OEM <input type="checkbox"/> | | OEM <input type="checkbox"/> | |
| 4.7 If AC / HP, rated cooling efficiency: ³² | 16 SEER | N/A <input type="checkbox"/> | | N/A <input type="checkbox"/> | | N/A <input type="checkbox"/> | |
| 4.8 If HP, rated heating efficiency: ³³ | 9.5 HSPF | N/A <input type="checkbox"/> | | N/A <input type="checkbox"/> | | N/A <input type="checkbox"/> | |
| 4.9 If HP, ratio of max. to min. rated capacity: | 3:1 | N/A <input type="checkbox"/> | | N/A <input type="checkbox"/> | | N/A <input type="checkbox"/> | |
| 4.10 If AC / HP, blower fan motor & speed type: ³⁴ | ECM | Single | N/A <input type="checkbox"/> | N/A <input type="checkbox"/> | | N/A <input type="checkbox"/> | |
| 4.11 If AC / HP, compressor speed type: ³⁵ | Variable | | N/A <input type="checkbox"/> | N/A <input type="checkbox"/> | | N/A <input type="checkbox"/> | |
| 4.12 If AC / HP, meter device type: ³⁶ | TXV | | N/A <input type="checkbox"/> | N/A <input type="checkbox"/> | | N/A <input type="checkbox"/> | |
| 4.13 If TXV or EEV, OEM subcooling target (°F): ³⁷ | 5 | | N/A <input type="checkbox"/> | N/A <input type="checkbox"/> | | N/A <input type="checkbox"/> | |
| 4.14 Filter performance metric and rating: ³⁸ | MERV 7 | | N/A <input type="checkbox"/> | N/A <input type="checkbox"/> | | N/A <input type="checkbox"/> | |
| Furnaces, Boilers, & Other Heating Equipment (If none of these will be installed, check "N/A") | | | | | | | N/A <input checked="" type="checkbox"/> |
| 4.15 Unique name or ID for each system: | | | | | | | |
| 4.16 Zone that system serves (See Item 3.6): | | | | | | | |
| 4.17 Equipment type: ³⁹ | | | | | | | |
| 4.18 Equipment manufacturer & model #: | | | | | | | |
| 4.19 AHRI ref. #, or check box for alt. OEM doc.: ³¹ | | | OEM <input type="checkbox"/> | | | OEM <input type="checkbox"/> | OEM <input type="checkbox"/> |
| 4.20 If furnace or boiler, rated heating efficiency: | | | N/A <input type="checkbox"/> | | | N/A <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 4.21 If furnace, blower fan motor & speed type: ³⁴ | | | N/A <input type="checkbox"/> | | | N/A <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 4.22 If furnace or boiler, heating capacity type: ⁴⁰ | | | N/A <input type="checkbox"/> | | | N/A <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 4.23 If furnace or boiler, venting type: ⁴¹ | | | N/A <input type="checkbox"/> | | | N/A <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 4.24 Filter performance metric and rating: ³⁸ | | | N/A <input type="checkbox"/> | | | N/A <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 5. Duct Design (Complete if duct system will be installed; otherwise check "N/A") | | | | | | | N/A <input type="checkbox"/> |
| 5.1 Unique name or ID for each system: | Dwelling Unit Duct System | | | | | | |
| 5.2 Zone that system serves (See Item 3.6): | Whole Dwelling Unit | | | | | | |
| Design Values for Cooling and Heating Mode | Cooling | Heating | Cooling | Heating | Cooling | Heating | |
| 5.3 Design blower fan airflow (CFM): ⁴² | 810 | 675 | | | | | |
| 5.4 Design blower fan speed setting: ⁴³ | Medium-High | Medium | | | | | |
| 5.5 Design external static pressure (IWC): ⁴⁴ | 0.5 | | | | | | |
| 5.6 Room-by-room design airflows (CFM): | Room Name | Airflow | Room Name | Airflow | Room Name | Airflow | |
| Total Design Airflow: | [All rooms] | 810 | [All rooms] | | [All rooms] | | |
| 1. | Living Room | 120 | | | | | |
| 2. | Kitchen | 180 | | | | | |
| 3. | Master Suite | 140 | | | | | |
| 4. | Master Bath | 100 | | | | | |
| 5. | Bedroom 1 | 100 | | | | | |
| 6. | Bathroom 1 | 90 | | | | | |
| 7. | Den | 80 | | | | | |
| 8. | | | | | | | |
| 9. | | | | | | | |
| 10. | | | | | | | |
| 11. | | | | | | | |
| 12. | | | | | | | |
| 13. | | | | | | | |
| 14. | | | | | | | |
| 15. | | | | | | | |
| 16. | | | | | | | |
| 17. | | | | | | | |
| 18. | | | | | | | |
| 19. | | | | | | | |
| 20. | | | | | | | |

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| 5.6 Room-by-room design airflows (Continued): | Room Name | Airflow | Room Name | Airflow | Room Name | Airflow |
|---|-----------|---------|-----------|---------|-----------|---------|
| 21. | | | | | | |
| 22. | | | | | | |
| 23. | | | | | | |
| 24. | | | | | | |
| 25. | | | | | | |
| 26. | | | | | | |
| 27. | | | | | | |
| 28. | | | | | | |
| 29. | | | | | | |
| 30. | | | | | | |
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| 32. | | | | | | |
| 33. | | | | | | |
| 34. | | | | | | |
| 35. | | | | | | |

Footnotes

1. The purpose of this report is to document the design information required by ANSI / RESNET / ACCA 310 – a standard for grading the installation of HVAC systems - for a dwelling, townhouse, or dwelling / sleeping unit. The HVAC designer should complete one report per dwelling, townhouse, or dwelling / sleeping unit that encompasses all HVAC systems (e.g., for a dwelling with two zones, the HVAC system for each zone should be documented in the same report).
2. Note that this report will be reviewed by users of the standard (e.g., a rater) to ensure that the design meets the tolerances defined in Section 4.3 of ANSI / RESNET / ACCA 310. The HVAC systems will not be eligible to earn recognition for proper installation unless all tolerances are met.
3. If the HVAC design documented in this report incorporated one or more options (e.g., media room option), then list those options.
4. If this same HVAC design could be used with other options (e.g., bonus room, balcony with sliding glass door), then list those option(s).
5. For example, the name of the development or the building’s address.
6. If this same HVAC design could be used with other plans (e.g., other dwelling unit models) in the building, then list those plan(s).
7. Because the loads are dependent on the dwelling / sleeping unit’s location in the building, indicate whether the design is for the **Top-Floor**, a **Mid-Level-Floor**, or the **Bottom-Floor** of the building; and either a **Corner Unit** or **Middle Unit** that is between two other units.
8. For example, the unique ID might be “Powder Bath Fan” or “Whole-House ERV”.
9. The ventilation equipment manufacturer and model number are required to be reported for dwelling / sleeping units not within a dwelling or townhouse; and are optional for dwellings, townhouses, and sleeping / dwelling units within (i.e., duplex).
10. Ventilation system types are: **Supply** - a supply-only system, **Exhaust** - an exhaust-only system, **Balanced w/o Recov.** - a balanced system without energy or heat recovery, **ERV** - an energy recovery ventilator, **HRV** - a heat recovery ventilator, **Vent. Dehumidifier** - a ventilation system with integrated dehumidifier, or **Other** - any other system type.
11. For example, common ventilation control locations include a bathroom or utility room.
12. For example, the ventilation zone name may be “Whole Dwelling”, “Upper Level”, “Lower Level”, or “Basement”.
13. Design basis options are: **62.2-2010** - ASHRAE 62.2-2010, **62.2-2013** - ASHRAE 62.2-2013, **62.2-2016** - ASHRAE 62.2-2016, **62.2-2019** - ASHRAE 62.2-2019, or **Other** - any other ventilation standard.
14. Enter the airflow rate of the ventilation system when operating (e.g., a 50 CFM cycled bath fan has a ventilation airflow rate of 50 CFM).
15. The following formula shall be used to determine the time-averaged ventilation airflow rate:

$$\text{Time Averaged Vent Rate} = \text{Vent Rate} * \text{Runtime Per Cycle} / \text{Cycle Time}$$

Where:

 - Time Averaged Vent Rate = The time-averaged ventilation airflow rate.
 - Vent Rate = The design’s ventilation airflow rate reported in Item 2.9.
 - Runtime Per Cycle = The runtime per cycle reported in Item 2.10.
 - Cycle Time = The cycle time reported in Item 2.10.
16. Design basis options for the heat gain and heat loss loads are: **ACCA Manual J v8 2013** - ACCA Manual J v8, 2013 edition; **ACCA Manual J v8 2016** - ACCA Manual J v8, 2016 edition; **2017 ASHRAE Fund.** - 2017 ASHRAE Fundamentals; or **Per AHJ** - a design basis prescribed by the Authority Having Jurisdiction.
17. Load methodology options are: **Room-by-Room** or **Single Block**. Note that for dwellings, townhouses, and dwelling / sleeping units within (i.e., duplex), the room-by-room load methodology must be used. See Fn. 2 for details.
18. Note that the outdoor design temperatures must meet the limits defined in ANSI / RESNET / ACCA 310 Appendix A for the county or U.S. Territory where the project will be constructed. See Fn. 2 for details.
19. The location shall include the city or weather station and the state. The data source options are: **ACCA** - ACCA Manual J, **ASHRAE** - ASHRAE Handbook of Fundamentals, or **AHJ** - design conditions prescribed by the Authority Having Jurisdiction.
20. For example, the heated or cooled zone name may be “Upper Level”, “Master Suite”, or “Basement”.

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21. To determine the number of occupants, calculate the number of bedrooms in the zone and add one.

ANSI / RESNET / ACCA 310 defines a "bedroom" for one- and two-family dwellings and townhouses as a room or space 70 square feet of floor area or greater, with egress window or skylight, and doorway to the main body of the dwelling unit, that can be used for sleeping. For all other Dwelling Units, a room or space that can be used for sleeping. For all dwelling or sleeping units, the number of bedrooms shall not be less than one. ANSI / RESNET / ACCA 310 defines an "egress window" as an operable window that provides for a means of escape and access for rescue in the event of an emergency and with the following attributes:

- Has a sill height of not more than 44 inches above the floor; and,
- Has a minimum net clear opening of 5.7 sq. ft., opening height of 24 in., and opening width of 20 in.; and,
- Is operational from the inside of the room without the use of keys, tools or special knowledge.

The number of occupants must fall within the tolerance specified in ANSI / RESNET / ACCA 310. See Fn. 2 for details.

22. The difference between the Conditioned Floor Area (CFA) used in the design and the actual dwelling, townhouse, or dwelling / sleeping unit must fall within the tolerance specified in ANSI / RESNET / ACCA 310. See Fn. 2 for details. Be advised, the CFA will be evaluated using the definition in ANSI / RESNET / ACCA 310, which defines this value, in part, as the floor area of the Conditioned Space Volume within a building or dwelling unit, not including the floor area of attics, crawlspaces, and basements below air sealed and insulated floors.
23. The difference between the window area used in the design and the actual dwelling, townhouse, or dwelling / sleeping unit must fall within the tolerance specified in ANSI / RESNET / ACCA 310. See Fn. 2 for details. Be advised, the window area will be evaluated by calculating it using the on-site inspection protocol provided in Normative Appendix B of ANSI / RESNET / ICC 301, which instructs the user to measure the width and height of the rough opening for the window and round to the nearest inch, and then to use these measurements to calculate window area, rounding to the nearest tenth of a square foot. See <https://codes.iccsafe.org/content/chapter/16191/> for the complete protocol.
24. "Predominant" is defined as the SHGC or R-value used in the greatest amount of window, wall, or ceiling area in the zone.
25. If both cavity and continuous insulation are used, report the sum of the nominal R-value of the cavity and continuous insulation.
26. The infiltration rate shall be reported using a qualitative input (i.e., **Tight, Semi-Tight, Average, Semi-Leaky, Leaky**) or in units of ACH50.
27. Provide loads for the orientation(s) that the design is intended to be used in (e.g., N, S, E, W), where orientation is defined as the direction that the front door of the dwelling is facing. For example, if a site-specific design has been completed for a single project, only the loads for the single orientation of that project need to be provided.
28. If the heat gain has been provided for multiple orientations, then the difference between the max. and min. total heat gain across the orientations specified must be reported and fall within the tolerance specified in ANSI / RESNET / ACCA 310. See Fn. 2 for details.
29. Equipment type options are: **AC** - Air Conditioner, **HP** - Heat Pump, **MNAC** - Mini-Split Air Conditioner, **MNHP** - Mini-Split Heat Pump, **MTAC** - Multi-Split Air Conditioner, **MTHP** - Multi-Split Heat Pump, and **Other** - any other cooling equipment type.
30. For single-package systems or systems without a condenser (e.g., evaporative cooler), provide manufacturer and model number in Item 4.4 and select "N/A" for Item 4.5.
31. If an AHRI Reference Number is not available, OEM-provided documentation shall be collected with the rated efficiency of the equipment. If the equipment contains multiple components, the rated efficiency shall reflect the specific combination of indoor and outdoor components, along with confirmation from the OEM that the two components are designed to be used together.
32. For example, if the metric for the rated efficiency of the equipment is SEER, then its SEER rating shall be reported; if the metric is EER, then its EER rating shall be reported; if both SEER and EER, then both rated values shall be reported.
33. For example, if the metric for the rated efficiency of the equipment is HSPF, then its HSPF rating shall be reported; if the metric is COP, then its COP rating shall be reported; if both HSPF and COP, then both rated values shall be reported.
34. Blower fan motor type options are: **PSC** - Permanent Split Capacitor, **ECM** - Electronically Commutated Motor, or **Other** - any other motor type. For blower fan speed type, while equipment typically has multiple speed settings to select from during installation, this parameter is related to the number of operational speeds that the blower fan is capable of: **Single** - a system that operates at no more than one speed setting each for heating mode and cooling mode, **Two** - a system that can operate at no more than two speeds each for heating mode and cooling mode, **Variable** - a system that can operate at more than two speeds.
35. The compressor speed type is related to the number of operational speeds that the compressor is capable of: **Single** - a system that operates at no more than one speed setting each for heating mode and cooling mode, **Two** - a system that can operate at no more than two speeds each for heating mode and cooling mode, **Variable** - a system that can operate at more than two speeds.
36. Meter device type options are: **Piston/Cap** - piston / capillary tube, **TXV** - thermal expansion valve, or **EEV** - electronic expansion valve.
37. If the meter device type is TXV or EEV, then provide then the OEM-specified subcooling target at the service valve.
38. For example, MERV or FPR.
39. Equipment type options are: **Furnace, Boiler**, or **Other** - any other heating equipment type.
40. Heating capacity type options are: **Single-Stage, Two-Stage**, or **Modulating**.
41. Vent. type options are: **Natural Draft** - natural draft system, **Mech. Draft** - mechanical draft system, or **Direct Vent** - direct-vent appliance.
42. Provide design airflow in cubic feet per minute of air with a density of 0.075 pounds per cubic feet. Airflow at this air density is often referred to as Standard CFM (SCFM) and represents air at 68 °F, 50% relative humidity, and at a barometric pressure of 29.92" Hg.
43. This is the OEM setting that corresponds with the design blower fan airflow. Common examples include low, medium-low, medium, medium-high, and high, but also may be defined in terms of dip-switch settings or other classifications.
44. This is the sum of the supply-side and return-side static pressure, corresponding to the mode with the higher design blower fan airflow.